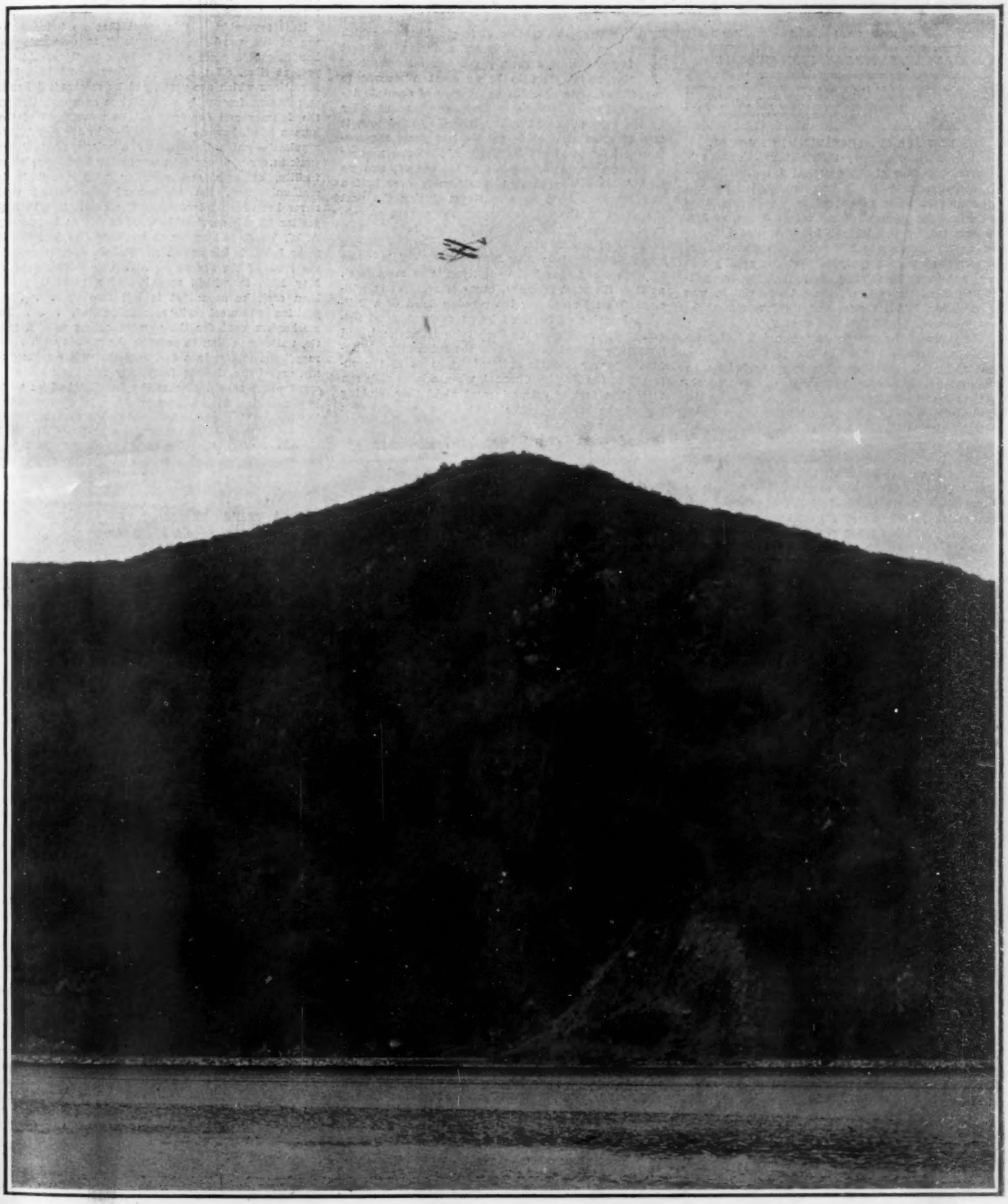
$15,000 FLYING MACHINE PRIZE OFFERED IN THIS NUMBER

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1910, by Munn & Co., Inc.]

A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. CII.—No. 24. ESTABLISHED 1845.] NEW YORK, JUNE 11, 1910. [10 CENTS A COPY. $5.00 A YEAR.



Copyright 1910 by Pictorial News Co.

THE HISTORIC FLIGHT OF GLENN H. CURTISS DOWN THE HUDSON RIVER.—[See page 480.]

SCIENTIFIC AMERICAN
ESTABLISHED 1845

MUNN & CO., Inc., - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York.
FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York.

TERMS TO SUBSCRIBERS.

Subscription one year..... $3.00
Postage prepaid in United States and possessions Mexico, Cuba and Panama.
Postage to Foreign countries..... $1.50 per year extra.
Canadian postage..... .75 per year extra.

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845)..... $3.00 a year
Scientific American Supplement (established 1876)..... 5.00 "
American Homes and Gardens..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., Inc., 361 Broadway, New York.

NEW YORK, SATURDAY, JUNE 11th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE NEW ERA OF AERONAUTICS IN AMERICA.

IT is a curious anomaly that, although America is the birthplace of the practical flying machine—a distinction which is universally admitted and stands in little danger of future disputation—the further development of the art of flying, as first demonstrated by the Wright brothers, has hitherto been confined mainly to European countries. To us, it has always seemed probable that our apathy was more apparent than real; and that, when sufficient stimulus was offered, the art of aviation was sure to come into its own, and its development be prosecuted with a zeal that was worthy of the energy and liberality of the country in which the first practical flying machine had its birth.

Evidently, the needed spur has been afforded by the phenomenal achievement of Glenn H. Curtiss in making his recent flight from Albany to New York at the unprecedented speed of over fifty miles an hour—a feat which vindicated both the far-sightedness and the liberality of the New York World, in offering a prize of $10,000 for such a flight in connection with the recent Hudson-Fulton festival.

Apart from the fact that so great a distance was covered at so high a speed, there are other considerations which largely account for the powerful hold which this flight has taken upon the public imagination; such, for instance, as the altogether untried nature of the course, the almost complete absence of suitable landing places, and the absolute composure with which, when an emergency landing had to be made, the aviator circled in his path, swooped down, bird-like, upon a small open clearing above the rocky and hill-covered cliffs, landed, started again on the final leg of his course above the crowded shipping of the North River, and finally came to rest on Governor's Island at the very doors of the house which was built for him during the Hudson-Fulton aeronautical contests. Here was a man who, at the very first trial, and over a course which, because of the encompassing mountains and ravines and the resulting air currents, was believed to be exceptionally difficult, accomplished with evident composure, and at times with a suggestion of complete *sang froid*, a feat of flying which, only six months before, was regarded as a dream of the enthusiast.

When the news of his accomplishment was flashed throughout the country, its effect was instantaneous and positively electric. The last doubt as to the practicability of long-distance, cross-country flying vanished; and the evidence of the awakening was shown in the almost immediate offer of over $100,000 in prizes for flights of a similar character, to be held during the present season in various parts of the United States. First came the simultaneous and munificent offers of $25,000 by the New York Times and the Chicago Evening Post for a Chicago-New York flight of about 960 miles, and of the New York World and the St. Louis Post-Dispatch of $30,000 for a St. Louis-New York race over a 1,000-mile course. Then the Washington, D. C., Chamber of Commerce and the Aero Club of Washington offered $20,000 for a 225-mile race from Washington to New York; and as we go to press, a $10,000 prize is being promoted in St. Louis for a flight from that city, over a distance of about 250 miles, to Kansas City, and $5,000 is offered for a flight over a 250-mile course from Indianapolis to Chicago.

Such are the attractive prizes that have been made available, within a week of Curtiss's flight, to promote long-distance feats of the same character. At the same time, through the liberality of Mr. Edwin Gould, as noted elsewhere in this journal, attention is being directed to the mechanical improvement of the aeroplane itself, with a view to enlarging its ability to remain continuously in the air and extend the duration of its single flights. The offer of the large sum of $15,000 for the best successful aeroplane provided with two motors, one to be held in reserve for emergency, is certain to prove a great stimulus to inventors and constructors, and should result in the production of some very interesting combinations of motive power.

The above *résumé* of the happenings of the past week surely justifies the statement that, when the history of the art of flying in America comes to be written, this period will stand out as second only in importance to those ever-memorable days, when the Wright brothers were making their flights above the sand hills of North Carolina in the first practical man-carrying and controllable aeroplane propelled by its own motor.

THE PERIL OF THE SUBMARINE.

JUDGED by the number of tragic disasters which has overtaken the submarine during the past few years, this greatly dreaded instrument of war might seem to be as great a menace to friend as to foe. In the absence of accurate information as to how many lives were accounted for by the submarine during the Russo-Japanese war, it is a question whether in the last ten years the submarine has not caused the death of a greater number of its own crews than it has of the enemy; and we hazard the statement that considerably over half a hundred lives have been sacrificed during the past ten years in the ordinary peace maneuvers of submarine vessels. The long roll of disaster is headed, in point of loss of life, by the sinking of the French vessel "Pluviose" on May 26th last, off Calais, when 28 officers and men lost their lives. The most fatal, as it is the most frequent, cause of accident is collision. We all remember the running down of a British submarine off Spithead by an outward-bound Orient liner, which came up from behind unnoticed, and apparently passed entirely over the submarine. Within the year a similar accident happened at the entrance to the English Channel, when a large ship ran through a fleet of submarines at night time, sinking one of the boats. To the same cause was due this recent French disaster, the "Pluviose" being struck by the paddle-wheel of a Calais-Dover passenger steamer as the latter was leaving Calais harbor.

At the same time, although we deplore the terrible loss of life which has occurred, we must not permit these disasters to shake our faith in the utility of the submarine; for the accidents have been chargeable to inefficient handling, or shall we say to lack of sufficiently wide experience, rather than to any inherent mechanical defects in the design or construction of the submarine itself. In recent years, outside of those due to collision, the losses have been chargeable, not to theoretical or mechanical defects in the boats themselves, but to carelessness or inexperience in their manipulation. Testimony to this effect was afforded by the diary (an amazing document) which the commander of the Japanese submarine, that was recently sunk, continued to write up to the very hour of his death, in which, with characteristic Japanese nobility, he took the blame for the loss of the vessel directly upon himself. Mechanically speaking, the highly-developed submarines of to-day, as exemplified in the latest types built for our own navy, are thoroughly reliable. The writer speaks from experience, having spent some four hours and traveled some twenty miles under the sea last summer off the point of Cape Cod, in the recently completed "Stingray." The vessel descended, ran on an even keel, rose to the surface, and was steered, with absolute precision; the air within the submarine was perfectly wholesome and free from odor; and the composure of the officers and crew betokened a perfect confidence in the stability of the vessel.

The disaster to the "Pluviose" proclaims the necessity for that eternal vigilance which is the pledge of safety in travel, not merely beneath the sea, but in the air and on the dry land. The charge can be no longer made against the submarine that it is "blind." In the perfected periscope, the vessel is provided with an eye whose vision is as clear as that of the binoculars of a commanding officer on the bridge of a warship. Furthermore, there has been produced and is now obtainable a periscope which commands a view of the complete horizon during such time as the submarine is within, say, ten or fifteen feet of the surface; and with such an instrument, given clear weather and a careful lookout, the danger of being run over by a ship coming up from behind should be completely eliminated. The accident to the "Pluviose" seems, however, to have been due to the submarine rising to the surface just ahead of, and in the path of, the Calais steamer. Here is a very real and not easily prevented danger. Although the commanding officer may take a careful survey of adjacent waters and note the position of other craft before he dives, such is the speed of modern vessels that a ship may easily have passed into close proximity by the time the submarine rises again to the surface, even though the period of submersion be limited. Collision on rising to the surface is a form of accident which for the present, at least, must be regarded as not entirely preventable.

"MECHANIPULATE."

IF the proper role for language to play in the round of our daily life is that not of master, but of servant of our necessities, we should surely be at liberty to add new words to our vocabularies whenever necessity calls for them. Let it be remembered, however, that the addition of the new word and the modification or elimination of the old should be done always in a spirit of profound conservatism, and only under the spur of a well-recognized necessity.

It is agreeably to this spirit that we indorse the use of the word "mechanipulate" to designate the handling of a piece of work by a machine. At the present time, all the many elaborate and ingenious operations which are performed by mechanical hands and fingers, frequently with a close approximation to the delicacy and dexterity of the movements of the human hand, have to be designated by the word "manipulate"—which is distinctly a misnomer. If the work in question could be *man*ipulated with the same facility, dispatch, and economy with which it is *mechan*ipulated, the mechanical operations would never have been introduced. The credit for the suggestion of this serviceable word is due to Mr. Henry A. W. Wood, and as far as we know, its first use is to be found in his article on "Modern Stereotypy," in the issue of the SCIENTIFIC AMERICAN SUPPLEMENT of May 14th, in which, speaking of a plate that has been cast, he says: "It is left face up . . . in position to be most easily mechanipulated, . . . the mechanism used for the purpose acting with a gentle, uniform motion to position the matrix with accuracy," etc. Then, in a foot note the writer says: "In my experience, I have frequently felt the need of a word which should express the 'handling' of its work by a machine, as the word 'manipulate' expresses the handling of the work of a man by his hands. To fill the gap I have made bold to coin and use the word 'mechanipulate,' which is here employed." In bringing the suggested word to the attention of the public, we invite a discussion of its merits in the correspondence columns of the SCIENTIFIC AMERICAN.

THE COLDEST REGION OF THE ATMOSPHERE.

THE decrease in the temperature of the air with increasing altitude—exemplified in the fact that the top of a mountain is colder than its base—is a matter of common knowledge. It is a fact that occasional inversions of this distribution of temperature may occur—as when fruit trees in a valley bottom are nipped by a frost that does not touch the hilltops; but it remains true, in general, that the temperature of the air decreases upward, and that the air at great altitudes is extremely cold as compared with that at the surface of the earth.

Until Teisserenc de Bort announced his discovery of the isothermal layer, eight years ago, it was not suspected that this decrease of temperature did not extend upward to the limits of the atmosphere. Now, however, we know that at a certain altitude, averaging, in middle latitudes, about 11,000 meters (7 miles), the fall in temperature with increasing altitude ceases rather abruptly, usually giving place to a *rise* of temperature for a certain distance upward, above which the temperature remains approximately constant as far as the highest ascents of sounding balloons have carried thermometric apparatus.

Hence, above any given spot on the earth's surface the air is coldest just below the region of the upper inversion, which marks the beginning of the great isothermal layer (or, as it is now called by its discoverer, the *stratosphere*).

The altitude of the isothermal layer varies with the barometric pressure at the earth's surface, with the season, and especially with the latitude. It is somewhat less over the poles than over middle latitudes, and very much greater over equatorial regions than anywhere else in the world. In other words, the decrease of temperature with altitude continues to a much greater height within the tropic than elsewhere, and this explains the fact that the lowest temperature ever registered in the atmosphere was met with almost exactly over the equator, viz., —84.3 deg. C. (—119.7 deg. F.), at an altitude of 19,300 meters (about 12 miles), at Shirati, on Victoria Nyanza, August 30th, 1908.

This was one of many interesting results of the remarkable series of sounding-balloon ascensions executed in equatorial Africa by the expedition under Beson and Elias, sent out by the Royal Observatory of Lindenberg, the complete report of which has just been published by the observatory.

ENGINEERING.

Concreting is proceeding so satisfactorily at the Gatun locks that in the upper or lake-level tier, which formed the subject of recent illustrations in our columns, about one-half of the work is completed. The grand total of excavation done on the canal during April was 2,632,468 cubic yards.

In a recent paper, Rear-Admiral Bacon of the British navy, discussing the probable battleship of the future, arrives at the conclusion that the race between gun and armor, which has been going on for over half a century, has been decided, for the moment, in favor of the gun; nor is there any indication of there being a chance of improving the armor and strengthening general construction, so as to render ships reasonably immune from armor-piercing projectiles.

The fact that the excavation of the Panama Canal through the Culebra range of hills has set in motion a mass of 2,000,000 cubic yards of material, which is sliding into the excavation apparently on an inclined substratum of clay, serves to illustrate one of the many advantages of the present high-level canal over one at sea level. The sea-level cut would have been carried eighty feet deeper, and the slides would have been, in all probability, enormously greater. The material will have to be removed; but outside of the additional expense, no ill effects are to be apprehended.

The Hudson and Manhattan Railroad Company is to be congratulated on having introduced some all-steel baggage cars for the transportation of baggage between the several steam railway terminals served by its system. The sides of the cars are provided with roller curtains. There are also folding aprons, which can be let down to bridge the gap between the loading platform and the car. Eight loaded baggage trucks can be wheeled directly into the cars; an arrangement which eliminates much handling and trucking and facilitates quick loading and unloading.

It has been determined that the sinking of the United States floating drydock "Dewey" at Olongapa in the Philippines was due to an omission to close the intake valves. Accidents of this character occasionally occur, and one is reminded of the sinking of the "Texas" at the Brooklyn navy yard, which happened shortly before the Spanish-American war. At the time of her launching, the "Dewey," 500 feet in length and 135 feet in width, was the largest floating drydock in the world. She will probably be raised intact.

Asked for his opinion regarding the probabilities of the introduction in the near future of gas engines as a motive power for driving large steamships, Sir William Henry White, for many years chief constructor of the British navy, recently stated that in his opinion the difficulty of high temperatures for the present effectually barred the way. If this problem could be mastered as to its mechanical features, it might be possible to utilize gas engines of 20,000 horse-power; but the proposals to drive battleships with gas engines "are so far only schemes."

The plan for opening a central avenue, one hundred feet wide, between Fifth and Sixth avenues from Eighth to Fifty-ninth streets, which is being actively favored by Mayor Gaynor, would undoubtedly relieve the congestion on Fifth Avenue, to say nothing of providing the city with a magnificent thoroughfare through one of its most important districts. The estimated cost of forty million dollars, however, is prohibitive. There are other public improvements, such as subways, municipal buildings, and public schools, that are more urgent than this.

An extraordinary record was made at target practice recently by the new battleship "South Carolina," of eight 12-inch guns, which has been in commission only three months. Coxswain J. R. Edwards, 21 years old, who is in his first enlistment, made a record with the 12-inch guns in the vessel's No. 4 after turret of 16 bull's eye target hits out of 16 shots in 4 minutes and 51 seconds. The hits per gun per minute for the whole 12-inch battery were 1.01, and 55 of 60 12-inch projectiles hit the bull's eye. Furthermore, three of the four turrets on the ship made 100 per cent of hits.

The advantages of oil over coal were illustrated in a recent trip of the "Yale," one of the 22-knot passenger steamers which run between New York and Boston. The trials were so satisfactory that oil will be used exclusively on these ships in the future. Outside of the absence of smoke from the funnels, is the complete abolition of noise and dust due to coaling. Formerly, the "Yale" burned on a round trip 235 tons of coal, which took eight hours to get aboard; in future it will take only an hour for an oil barge to pump into the ship's tanks the 48,000 gallons of oil which will serve for the round trip. The principal saving, amounting to $500 a month, is due to the fact that eight operators do the work in the boiler room, where formerly forty-eight stokers were necessary.

ELECTRICITY.

In their tour of the Great Lakes this month, the members of the Chicago Association of Commerce will be able to keep in telephonic communication with their Chicago offices. Their steamer, the "Theodore Roosevelt," is fitted with a wireless telegraph outfit, and also with a telephone system which may be connected with land lines at the docks where the steamer puts up.

The indirect system of illumination, which consists in casting the light of a lamp against a white surface, such as a ceiling, and having it reflected and diffused thereby, is rapidly growing in favor. In order to make this system possible with the use of arc lamps, an improved type of arc lamp has been devised by an English concern, in which the carbon-feeding mechanism is placed below the arc. The result is virtually an inverted arc lamp, and there is practically no obstruction to the light passing upward, except for the means of suspension from the ceiling.

This fall the annual meeting of the Illuminating Engineering Society is to be held at Johns Hopkins University. Arrangements have been made for an extended course of lectures on the subject of illuminating engineering, immediately after the convention. Thirty-six lectures will be given from October 26th to November 8th, and facilities are provided for practical demonstrations and laboratory work in connection with the subjects taken up. It is hoped that these lectures will result in a course of study in this branch of engineering for undergraduate technical schools. It is realized that there is a scarcity of practical illuminating engineers.

In Norway and Sweden the question of hydro-electric generation of power has recieved a great deal of attention from the fact that there are so many rivers in these countries capable of such development. Contrary to the custom in this country, it is the practice in Sweden to couple generators directly with slow-speed turbines. One interesting form of turbine generator consists of two wheels, the shaft of one passing through the hollow shaft of the other. The wheels turn in opposite directions, and one shaft carries the armature, while the other carries the fields of the generator. This virtually amounts to doubling the speed of the generator, or reducing the number of poles. Hydraulic thrust bearings are used. At Korsnas, Sweden, there are four pairs of turbines on a single shaft, developing 420 horse-power. The fall is but six feet, and the wheels make but 107 revolutions per minute. At Stangfjorden, in Norway, where there is a fall of 200 feet, a single wheel is used, producing 3,300 horse-power, running at a speed of 300 revolutions per minute.

Mention was recently made of a combined stethoscope and telephone relay, by which the heart beats of a patient in London could be heard in the Isle of Wight. In a paper read before the British Institute of Electrical Engineering, S. G. Brown, the inventor, described the construction of this relay. It comprises a gap of 0.000,000,5 centimeter between platinum electrodes. The current of a dry cell will flow across this microscopic break, but any slight variations in this distance will vary, greatly, the current passing across the gap. The principal difficulty encountered was the question of preserving a gap of such microscopic proportions. It was evidently impossible to maintain the gap mechanically, but a system has been devised whereby the gap is automatically maintained by the current itself. Despite the delicacy of the adjustment, the relay may be turned upside down without affecting the gap. With this relay the fluctuations in feeble currents may be magnified twenty foid. An illustrated description of this relay and stethoscope will be published in next week's issue of the SCIENTIFIC AMERICAN.

The wireless telegraph station which has been recently erected by the French government on the Channel coast at Boulogne is of interest from the fact that it represents the first official application of the Bellini-Tosi system of directed waves. The new plant at Boulogne is operated by the French Postal and Telegraph department and is laid out so as to be operated either by the usual method or by the Bellini-Tosi system. Accordingly the plant has an ordinary vertical antenna and an antenna for directed waves. These aerial systems are supported by four structural iron towers 155 feet high placed at the corners of a 260 foot square. Four cables connect the tops of the towers, and the Bellini-Tosi antenna consisting of two groups of wires, is suspended from these. Each group is formed of two vertical antennæ converging towards the top, each having six parallel wires spaced 13 feet apart. These antennæ form a triangle with a horizontal section near the ground and two inclined wires. At the top the antennæ are 260 feet apart and at the bottom 420 feet. The new station is working with the French stations of Saintes-Maries, on the Mediterranean coast, and also with the Algiers post.

SCIENCE.

Prof. Eduard Friedrich Wilhelm Pflueger, who died on March 17th at the age of 81, at the end of over sixty years of single-minded and unswerving devotion as a student of physiology, was best known to the scientific world by the 131 volumes of Pflüger's Archiv. To that monumental publication many a distinguished scientist has contributed. Pflüger himself made a special study of the mechanism of spinal action in the frog, and the law of reflex action as studied upon the decapitated animal was one of his earliest investigations. His work on physiological consumption in living organisms has played an important part in our knowledge of the chemical respiration of the tissues.

During the past three months the United States Weather Bureau has introduced a simplified form of weather map, known as the "commercial weather map," for publication in the daily newspapers, and this now appears regularly in about forty papers. This is an innovation of far-reaching importance, as it gives a much wider circulation to the information contained in the map than it has had heretofore. While the matter is still in the experimental stage, it appears altogether probable that the newspaper maps will ultimately replace the maps now published by Weather Bureau stations throughout the country, resulting in a great saving of expense to the government and the advantage to the public above mentioned.

Prof. Kronacher has studied the power of yohimbin to increase the flow of milk of cows and sheep. The results prove that the yield of milk is increased during the administration of yohimbin, but the increase is not sufficient to make an extensive use of yohimbin as a galactogogue commercially profitable in the case of healthy animals. In the case of a cow, whose yield of milk was diminished by an inflammation, the disease was greatly mitigated by the treatment, and an increased yield of milk followed. Many similar instances were observed. In no case did any injurious results follow the administration of the medicine. No experiments have yet been made on the influence of yohimbin as a galactogogue in the human species. In this case, the question of expense is of less relative importance, and the favorable results obtained with animals appear to promise a successful outcome.

The alloys of iron with metals other than those which enter into the composition of cast iron and steel have been little studied. In order to ascertain if any of these alloys possess useful electrical properties, Burgess and Aston have made a series of experiments with alloys of iron with arsenic, bismuth, and antimony. The iron which they employed was obtained by the electrolysis of very pure Swedish iron. The metals were melted together in the electric furnace in a crucible of magnesia. The alloys were cast into bars, which were subjected to various thermal treatments, and were investigated for magnetic permeability and hysteresis. The results show that the presence of antimony in iron always injures the mechanical strength of the metal, and sometimes makes it worthless. Small quantities of arsenic improve the magnetic properties of iron and increase its electrical resistance. Bismuth produces the same effect, but it must be added in larger quantities than arsenic.

"The sun glows in the Lion," says Seneca, meaning that when the sun enters the sign of Leo, at the summer solstice, the highest temperature of the year is experienced. We may say, on the other hand, that the Babylonian astrologers, thousands of years ago, placed the king of beasts, the fiery and ferocious lion in that part of the zodiac which the sun enters at the summer solstice. The constellation which is called Leo bears very little resemblance to the outline of a lion. Probably the name was originally applied only to its principal star, Regulus. It is to this constellation in the zodiac that we owe the countless water-spewing lions' heads, which are found in ancient and modern fountains, because in the latter part of July, while the sun is still in the sign Leo, the Nile is at its highest level. Furthermore, the lion's head with widely open jaws is in itself very suitable for the mouth of a fountain or water spout. This decorative *motif* was employed universally throughout the Greco-Roman world. Lions' heads are found used in this way at Athens, Ephesus, Olympia, Agrigentum, and countless other places. It is not quite certain that this employment of the lion's head originated in Egypt, Curtius describes an Assyrian bas-relief from Bairan, showing water streaming from a ring-shaped vessel. A lion stands as if on guard on either side of the fountain. The water clock, which was used in judicial proceedings, had the form of a lion and a name which means the guardian of the stream. Hence the idea of protection may have been the origin of the association of lions with fountains, and this custom may have originated in Asia.

THE OCEANOGRAPHIC MUSEUM AT MONACO

BY DR. ALFRED GRADENWITZ

The Prince of Monaco, besides being the ruler of one of the smallest though most charming countries, has achieved fame in the world of science, has endowed his principality with a scientific institute unique in its kind, viz., an oceanographic museum destined to contain not only the enormous collections brought home from his own voyages of discovery, but, generally speaking, everything relating to the investigation of the sea and its inhabitants, animal and vegetable.

This museum, which was solemnly inaugurated some weeks ago, is situated in a site of surpassing beauty on a precipitous rock dominating the Mediterranean, close to the famous St. Martin Gardens, thus allowing of the installation of two basement stories, which open immediately on the sea for the sake of certain scientific investigations. The foundation works of the building had obviously to be most elaborate, the more so as some of the pillars start nearly from the level of the sea.

The building, 100 meters in length, is of a most imposing appearance, and is a masterpiece from an architectural point of view. Each of its monolith columns, 8 meters in length, is 16 tons in weight. Most of the motives of decoration are derived from the fauna of the ocean.

When entering the ground floor, we are at first struck by the imposing mosaic floor, on which is represented—likewise in mosaic—the "Princesse Alice," the yacht on which the Prince has achieved his most important scientific cruises. Everywhere around the hall are seen ornamental subjects representing fishes and other inhabitants of the ocean. On both sides a monumental staircase leads up to the first floor.

The museum of Monaco.

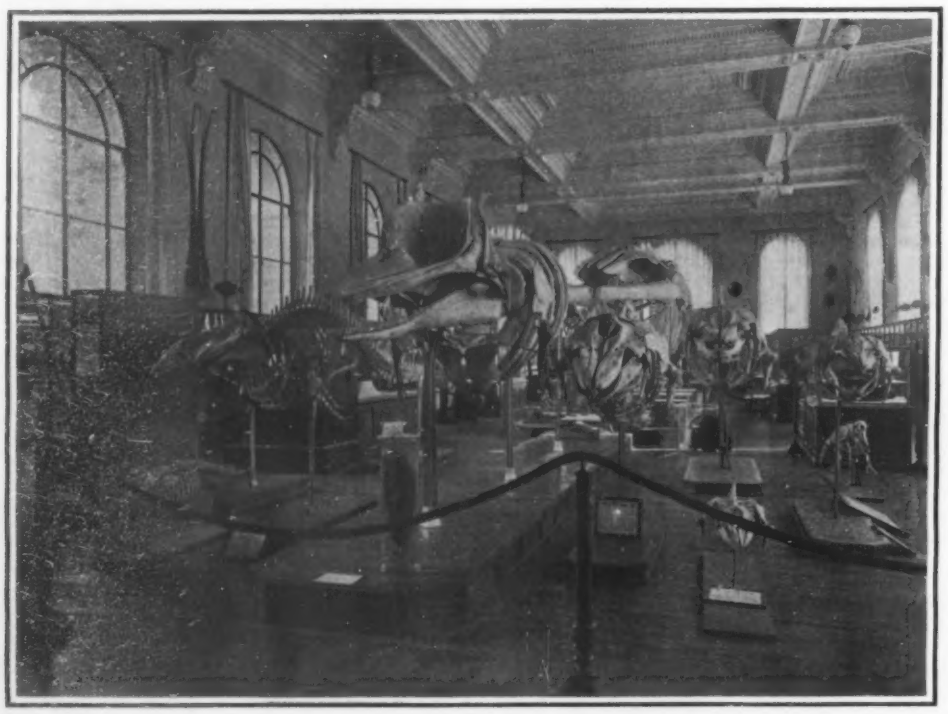
After passing through a huge glass-paned door, we enter a large assembly hall, 7 meters high, adorned with four beautiful columns of Brescia limestone, from the ceiling of which is suspended in the center an electric luster representing a medusa, whereas each of the four angles is taken up by a smaller luster forming a glass sphere adorned with long prisms reminding of sea anemones, star fishes, and other radiata. In front is seen a large statue of the Prince, representing him on board his yacht searching the horizon.

The western hall is set apart for lectures, congresses, and other assemblies, a large part of its back wall being taken up by an artistic painting representing the "Princesse Alice" on an intensely blue and somewhat agitated sea.

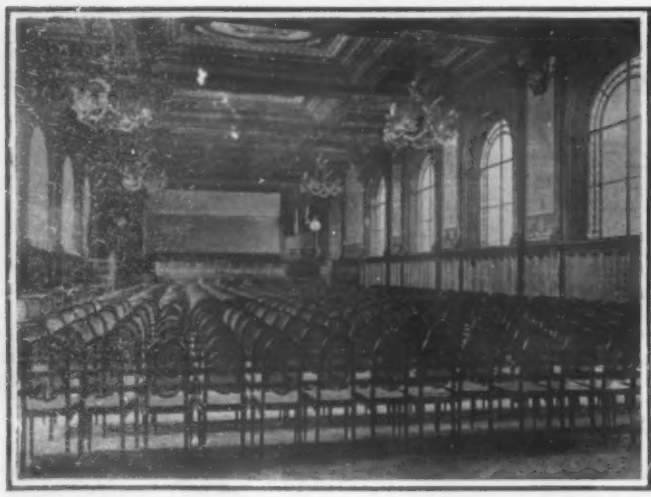
The eastern hall is taken up provisionally by sundry collections of zoological subjects and oceanographical instruments, but is destined particularly for the collections brought home from the Prince's voyages, which include the rarest and most beautiful specimens. In fact, the wonderful equipment of the "Princesse Alice" has allowed the sea to be searched down to a depth of more than 6,000 meters, while four expeditions in Arctic districts, beyond 80 deg. northern latitude, have yielded specimens of the Arctic fauna, suggestive of the most interesting comparisons with those of the Mediterranean and the Northern Atlantic respectively.

Whereas these zoological collections are housed in the right-hand half of the hall, the exhibits on the

(*Concluded on page 489.*)



Skeletons of whales, narwhals, and other ocean giants.



The large assembly and lecture hall of the oceanographic museum of Monaco.

Implements for marine biological sounding in the oceanographic museum of Monaco.

Statue of Prince Albert in the museum.

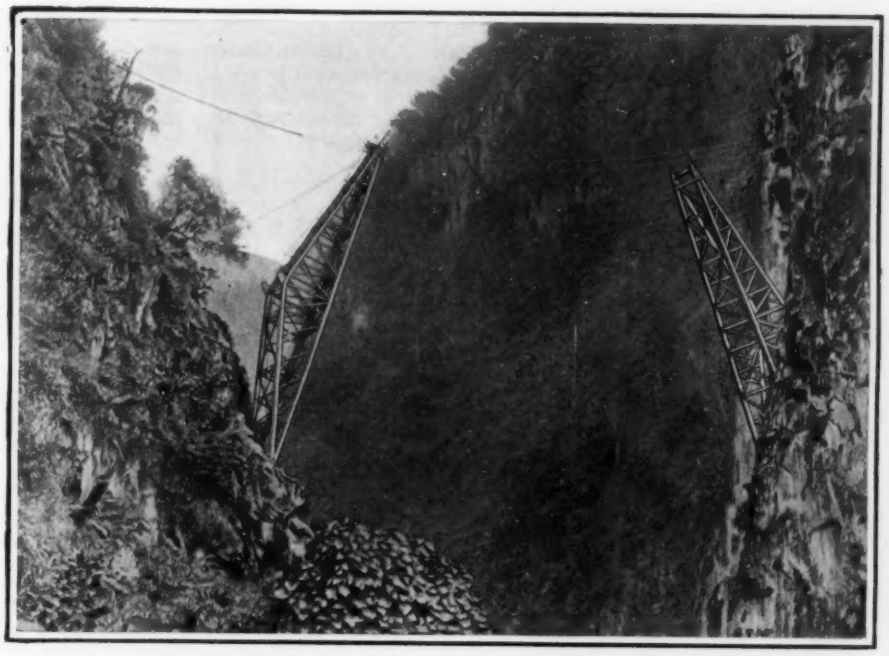
THE OCEANOGRAPHIC MUSEUM AT MONACO.

THE NAM-TI BRIDGE

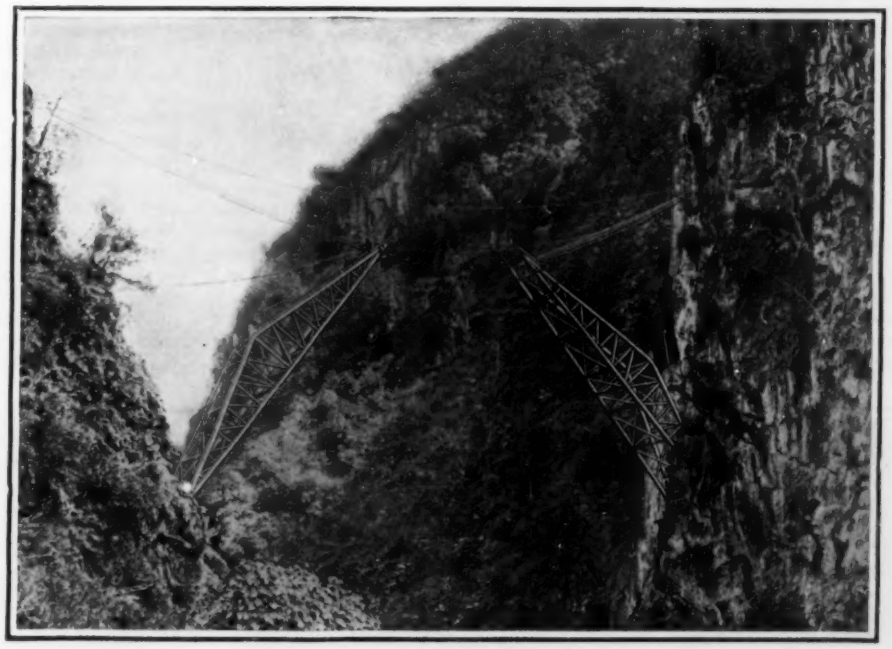
A REMARKABLE NEW RAILWAY BRIDGE IN SOUTHERN CHINA

The Yunnan Railway Company is completing the construction of a line which will connect Laokay, a frontier town of the French Asiatic possessions, with Yunnansee, the capital of Yunnan, and will be of great importance in developing the commerce of Indo-China and Tonkin. The construction of this railway through one of the most tightly closed provinces of China has been greatly impeded by the climate, the difficulty of transportation and the incompetence of native workmen. Owing to these difficulties, the original plan of crossing most of the streams by means of stone viaducts was abandoned after a few unsatisfactory experiments, and it was decided to employ, as far as possible, steel bridges, of various types to suit local requirements, and so designed that they could be constructed in parts at the Batignolles works in Paris, forwarded to their destinations, largely by rail, as the line advanced, and quickly put into place. The bridge thrown over the Nam-Ti River and the peculiar methods employed in its construction are here described and illustrated. At this point the river flows through a deep gorge between nearly vertical cliffs, which the railway pierces by means of two curved tunnels, at a level more than 300 feet above the bed of the stream. The width of the chasm at this level of the railway is about 220 feet. In these conditions, the construction of a simple truss bridge of a single span would have entailed much labor, expense and delay, owing to the necessity of working underground and of greatly enlarging one of the tunnels in order to obtain room for the partial assembling of the heavy and deep truss required. It was desirable, furthermore, to begin the construction of this comparatively large bridge before the railway had been extended to the gorge, in order to avoid any interruption in the progress of the line. Consequently, owing to the entire absence of wagon roads, the greater part of the material and machinery had to be carried a considerable distance on the backs of mules and men, in parcels not exceeding 8 feet in length or 175 pounds in weight. These considerations determined the choice of the type and method of construction shown in the accompanying illustrations.

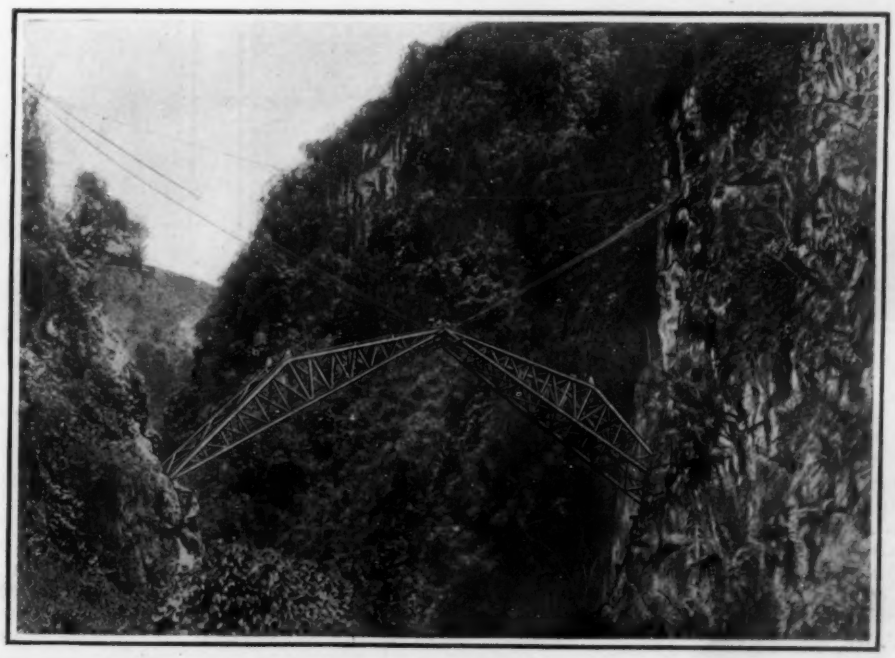
The superstructure of the bridge is composed of four independent double trusses, the ends of which rest on abutments at the mouths of the tunnels and on three intermediate supports, furnished by the joined upper ends of two inclined supporting trusses of triangular profile and by two latticed pylons, which rise from the mid points of the supporting trusses. The lower ends of the supporting trusses rest on abutments constructed on artificial ledges on the walls of the gorge, about 60 feet below the railway. The distance between these abutments is about 180 feet, but the total length of the superstructure of the bridge is about 220 feet.



Beginning the lowering of the supporting trusses.



The supporting trusses lowered half-way.



The supporting trusses lowered to their final positions.

THE NAM-TI BRIDGE.

The supporting trusses were shipped from France in parts small and light enough to be carried by men and mules, while the upper trusses, the pylons, and the joint connecting the supporting trusses were sent out in riveted sections of comparatively great size and weight, which could be transported only by rail, as it was designed to have the railway completed to the gorge by the time the construction of the supporting trusses would be finished.

The supporting trusses are attached to their abutments, as they are to each other, by movable joints. They were assembled in nearly vertical positions and their upper ends were subsequently lowered until they met.

Each of the supporting trusses is composed of two single triangular trusses, the planes of which are inclined symmetrically to the vertical at angles of 14 degrees. These trusses are about 25 feet distant from each other at their lower and outer ends, and about 11 feet at their upper and inner ends. The straight bottom chord of each single truss is composed of two vertical plates about 2/5 inch thick and 14 inches deep, separated by an interval of 10 inches, suitably connected and stiffened by L-bars, or angle plates. The top chord, which forms a broken line, is of similar construction but variable section, and is reinforced above by transverse plates about ½ inch thick. The truss is completed by pairs of light L-bars placed normally and obliquely to the bottom chord. The two single trusses of each supporting truss are connected by cross braces in the planes of the normal bars and in the three planes of the bottom and top chords.

The lower and outer end of each single truss is supported on a stone pier, by means of a ball-and-socket joint of steel. The concave member of the joint is attached to the truss; the convex member is fitted to the pier by means of a bed plate and adjusting wedges. The radius of curvature of the joint is about 6 inches. The upper and inner ends of the trusses are connected by hinge joints, having pins of forged steel, 7.6 inches in diameter. These pins are perpendicular to the planes of the single trusses and, consequently, are not horizontal, but the amplitude of oscillation is so small that this slight inclination does not impair the freedom of the joint.

Although the weight of the bridge is sufficient to insure transverse stability in the

strongest winds, additional resistance is given by steel bars attached to masonry anchorages and to the rock.

The superstructure of the bridge is composed of two terminal spans, 51.6 feet and 71.7 feet long, and two intermediate spans, each 48.2 feet in length. The trusses have a uniform depth of about 6½ feet. The floor beams which connect the top chords of the two single trusses are 16 inches deep and about 1/3 inch thick.

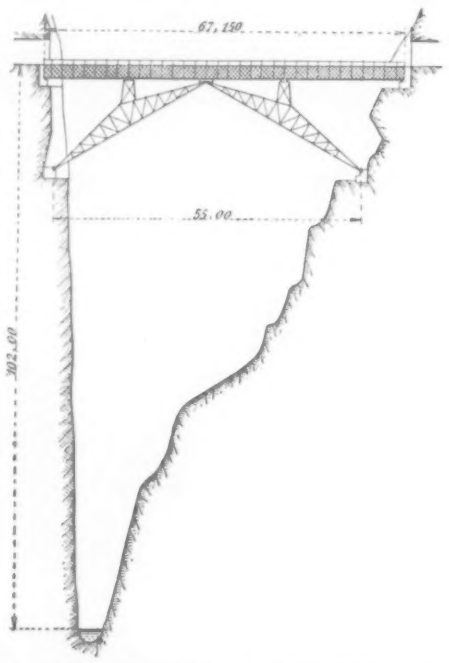
The most interesting feature of the Nam-Ti bridge is the method by which it was erected. Before the various parts of the supporting trusses had reached the tunnel nearest the French possessions, a windlass was set up over the mouth of each tunnel, and the cables of these windlasses were joined together, so that material suspended from the junction could be carried across the gorge by unwinding one cable and winding up the other.

The supporting trusses were partly assembled into a few large sections in the tunnels. These sections were then hoisted to their proper places in the trusses, which were erected in a nearly vertical position and supported by the ball-and-socket joints at their lower ends and by temporary stays and timbers. The terminal section of the truss, including the socket, was first placed in position on the ball of the joint, which was anchored securely to the rock. The outer halves of the upper chords, with the ties and braces lying in their common plane, were next erected. The rectangular frame thus formed, which leaned against the cliff and was also stayed by ropes and timbers, was then attached to the interior of the tunnel by two tackles strong enough to prevent it from being dragged forward by the weight and leverage of the remaining parts, as they were added, and to maintain the completed truss in its vertical position. This frame then served as a scaffold for the assemblage of the bottom chords of the truss and their attachments. In this position of the truss the bars which are perpendicular to the bottom chords were so nearly horizontal that they formed convenient supports for the few planks on which the workmen stood. After the bottom of the truss had been completed, the inner halves of the top chords were assembled in the same manner, some of their auxiliary parts being temporarily omitted in order to lighten the inner ends of the truss. The parts were temporarily joined by means of lathe-turned bolts, in order to secure the greatest possible precision, but the construction of the supporting trusses was so far in advance of that of the railway that it was found possible to replace most of the bolts by rivets before the track had been extended to the gorge. Meanwhile, in order to save time, a file of coolies, marching five feet apart, carried through the tortuous mountain passes for more than 12 miles, the two heavy chains, each 900 feet long, which were employed in lowering the supporting trusses to their final positions. The other machinery required for this purpose, as well as the sections of the upper table of the bridge, was brought by rail.

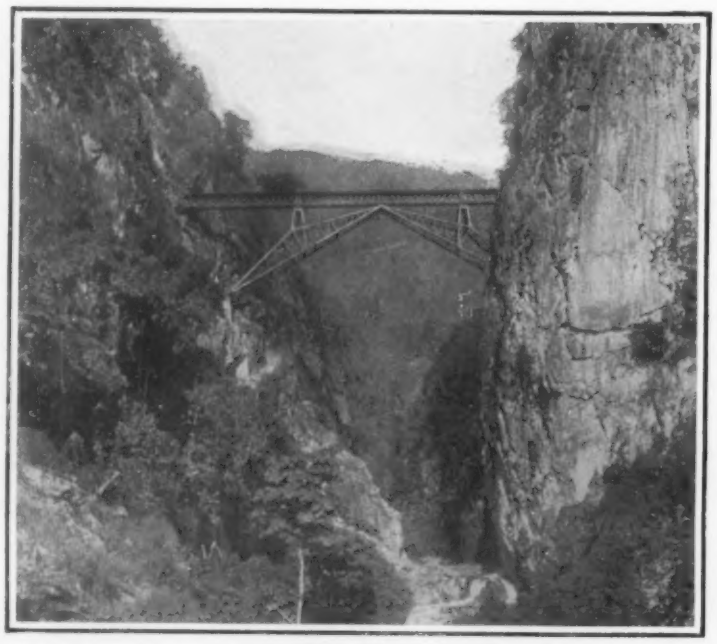
The lowering was accomplished by means of two great pulley blocks, anchored to the face of the cliff above the tunnels and connected by the two long chains with two similar blocks, attached to the upper ends of the trusses. The chains were first drawn taut in order to slacken the temporary tackles attached to the interior of the tunnels and allow their removal. The chains were then slowly paid out, by means of windlasses provided with brakes, allowing the two trusses to turn around their outer ends, like the halves of a bascule drawbridge, until their inner ends came together. In order to facilitate this operation, both trusses carried sights at their inner end, and one of them, which was lowered a little after the other, bore both parts of the hinge joints by which the trusses were to be connected.

The omitted parts of the trusses were then added, a bed plate was constructed over their junction, and a pylon, which had been partly assembled in frames of two posts, was erected over the middle of each truss.

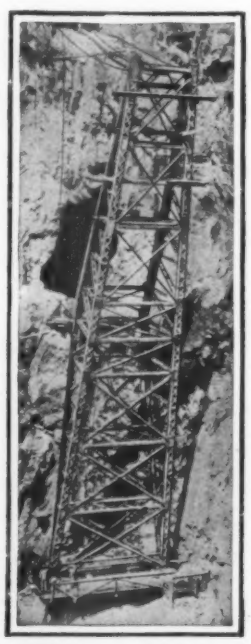
The upper table of the bridge was assembled, as a continuous truss, in a straight and not very long excavation in the first tunnel. As its construction progressed it was moved forward with the aid of rollers placed on the two pylons and the junction of the supporting trusses, until it had been completed and its forward end had reached its abutment on the opposite side of the gorge. The connections between the four spans were then removed. The construction of the bridge was commenced in March, 1908, and was completed in November of the same year.—G. Bodin, in Le Génie Civil.



Side view of the bridge and section of the gorge, with dimensions in meters.



The completed structure; the rails of which are 881¼ feet above the river.



One of the supporting trusses, as erected, in a vertical position.

THE NAM-TI BRIDGE.

At the Höganäs coal mines in the south of Sweden, states the Iron and Coal Trades Review, experiments have been carried on for some time with the smelting of fine iron ore by means of Swedish coal. These experiments were at first conducted with a Gröndal furnace using coal of an inferior quality, for which it was desired to find an outlet. Later the chief director of the Höganäs coal mines undertook to conduct the experiments independently, and it appears that he has now obtained favorable results, and that sufficient data have been collected to allow of exact calculations and estimates being made. The owners of the Höganäs coal mines—the Billesholm Aktiebolag—have, in consequence, resolved to build a furnace with a capacity of 15,000 tons of fine iron ore per annum. When this furnace has been tested in practice with the view of discovering possible faults, the intention is to erect nine other furnaces of the same size and capacity.

Recent Spectroscopic Study of the Sun.

The physical interpretation of the changes produced in the lines of the solar spectrum, by terrestrial weather conditions and by passing from one to another point of the sun's disk, is still under discussion. Whittaker refuses to attach any definite significance to changes of temperature occurring in the stormy solar atmosphere, nor does he admit that the peculiarities of spark spectra are characteristic of elevated temperatures. Electric vibration of atoms may be excited in a cold gas, as is proved by the aurora. Whittaker attributes the observed changes in the spectrum to great pressure. Cortie and Evershed, on the other hand, defend the usual interpretation, which attributes the changes to high temperature, radial velocity and chemical action. Evershed does not admit that pressures much greater than atmospheric can exist in the sun, even at the bottom of the reversing layer. This opinion is based upon the sharpness of spectral lines in general. But the hypothesis implies that in the sun gravitation is everywhere opposed by repulsive forces.

Until recently the spectro-heliograph was applied chiefly to the lines *H* and *K*. Thus were obtained images of the flocculi, those bright clouds of calcium vapor which almost cover the sites of the spots and faculæ. Since 1908, following the example of Hale, the red line of hydrogen, which shows entirely different forms, has also been employed. This has led to the discovery of long dark filaments, which normally persist for several weeks, but which sometimes disappear or change rapidly near very active spots. According to Deslandres these filaments represent tornadoes with horizontal axes. They are exhibited especially by the middle part of the line *H a*, which corresponds to the upper limit of hydrogen vapor. The marginal portions of the same line show dark flocculi, which are reversals of the calcium flocculi.

The photographs made by Hale, at Mt. Wilson, with this same line, show the spots surrounded by cyclonic structures, which exhibit opposite rotations in the north and south hemispheres. These spirals are far less frequently observed in ordinary photographs. Can they be trajectories of material particles? The first evidence, furnished by Hale, consists in the doubling and the polarization of the spectral lines in the interior of the spots. These phenomena suggest the circulation of electrified matter in a magnetic field. Evershed sought further evidence by placing the slit of the spectroscope across a spot near the sun's limb. In this case radial velocities in opposite directions should be found on opposite sides of the spot. Instead of this, however, Evershed found numerous and persistent indications of a tangential movement, always directed from the center of the spot. These results were obtained chiefly with the lines of iron. Possibly both movements coexist at different levels; the whirlwinds in a stratum of hydrogen; the centrifugal flow in metallic vapors beneath.

Secchi, who discovered that the dark lines of the solar spectrum become bright or reversed in a narrow stratum at the base of the chromosphere during a total eclipse, contended that this reversal could be observed at ordinary times. Hale and Adams have confirmed his view by photographing the reversed spectrum. Their success appears to be due to the very delicate adjustments which enabled them to keep the slit of the spectroscope accurately tangent to the sun's limb. The wave lengths of 124 of the lines were measured and were found exactly equal to those of the corresponding dark lines of the ordinary spectrum. This perfect agreement could not be expected if, as Julius suggested, the bright lines are due to the light of the photosphere, affected by anomalous dispersion.

To blacken light woods make a preparation of an ounce of borax, dissolved in a quart of water, with two ounces of shellac. The liquid is then to be boiled until a perfect solution is obtained, then stir in two teaspoonfuls of glycerine, and complete by adding a sufficiency of soluble aniline black to completely darken the liquid, which will now be ready for use.

Instruction in Aeronautics at the University of Paris.

A Chair of Aeronautics has been established at the University of Paris by M. Basil Zaharoff, and is occupied by Prof. Marchis, who has announced the programme of his course of lectures. The professor begins by replying to the criticism that M. Zaharoff's endowment would have been employed far more usefully for the development of aerial navigation if some direct encouragement had been given to constructors, who are compelled to make very costly researches, or to the brave aeronauts who risk their lives in these experiments. The empiricism which necessarily rules in the beginning of every industry should now be superseded by a methodical and rational interpretation of observed facts. The object of this lecture course will be to expound as logically as possible the results which can fairly be considered as certain. Without entering into very recondite theoretical considerations, the lectures will still be far from "popular" or elementary. Finally, the development of the special aeronautic library already possessed by the University, and the formation of a collection of small models of aeroplanes and dirigible balloons, will supplement the instruction given by the lectures. The professor will not confine his attention to theoretical speculations and laboratory researches, but will follow in detail the experiments of constructors and the trial flights of aviators, noting in each case the progress achieved and endeavoring to account for the failures.

Scientific American Prizes for Inventors.

The SCIENTIFIC AMERICAN offers $100 in three prizes, to be awarded to the inventor who gives the best account of how he conceived his invention, how he developed it in actual practice, and how he succeeded in selling it. This sum of $100 to be distributed as follows: $50 to the best account, $35 to the second best account, $15 to the third best account.

There is no limitation as to subject matter of the invention. In other words, the invention may be a household utensil, a game, a piece of electrical apparatus, an improvement in railway construction, a metallurgical process, etc. The following conditions, however, must be observed:

1. The invention must be patented.
2. The inventor must have actually sold his patent, and the invention must have been commercially introduced.
3. The account of the inventor's success must not be longer than 800 words.
4. The composition, letter, or article must be typewritten on one side of the paper only.
5. The inventor must sign his offering with a pseudonym, and inclose it in a sealed envelope, upon which the pseudonym is written. A second sealed envelope must be provided, bearing on the outside the pseudonym under which the offering is submitted, and containing the real name and address of the contestant.
6. Contestants must address their offerings to Inventors' Prize Editor, SCIENTIFIC AMERICAN, 361 Broadway, New York city.
7. The contest remains open until August 15th, 1910. Judges will select the essays which, in their opinion, have won the three prizes and give them to the Editor of the SCIENTIFIC AMERICAN, who will thereupon open the sealed envelopes containing the true names of the contestants, and notify the winners of the prizes.
8. The Editor of the SCIENTIFIC AMERICAN has the right to publish the prize winning articles or letters as well as those which may not receive prizes.
9. Unsuccessful letters cannot be returned. It is thereupon urged that the contestants preserve copies of their contributions.

Official Meteorological Summary, New York, N. Y., May, 1910.

Atmospheric pressure: Highest, 30.40; lowest, 29.46; mean, 29.96. Temperature: Highest, 81; date, 24th; lowest, 44; date, 5th; mean of warmest day, 71; date, 29th; coolest day, 52; date, 5th and 15th; mean of maximum for the month, 67.6; mean of minimum, 52.8; absolute mean, 60.2; normal, 59.3; average daily excess compared with mean of 40 years, 0.9. Warmest mean temperature of May, 65, in 1880; coldest mean, 54, in 1882. Absolute maximum and minimum of May for 40 years, 95 and 34. Average daily excess since January 1st, 3.4. Precipitation: 1.66; greatest in 24 hours, 0.65; date, 20th and 21st; average for May for 40 years, 3.18. Accumulated deficiency since January 1st, 1.38. Greatest precipitation, 9.10, in 1908; least, 0.32, in 1903. Wind: Prevailing direction, northwest; total movement, 8,211 miles; average hourly velocity, 11.0; maximum velocity, 38 miles per hour. Weather: Clear days, 8; partly cloudy, 9; cloudy, 14; on which 0.01 or more of precipitation occurred, 11. Mean relative humidity, 64.6. Dense fog: 8th, 9th, 23rd, 30th; thunderstorms: 9th, 14th, 21st, 30th. Mean temperature of the spring, 52.97; normal, 48.30. Precipitation of the spring, 7.05; normal, 10.58.

Correspondence.

REDUCTION-GEAR TURBINE TESTS.

To the Editor of the SCIENTIFIC AMERICAN:

Your article "A Way Out of the Marine Turbine Dilemma," in your issue of the 12th of February, places before the general reader throughout the world an epoch-making invention. There can be little doubt as to its great value, and any discussion that hastens the proof thereof may be welcome.

You refer to the difficulty of ascertaining the actual horse-power of a turbine as a factor of uncertainty in the calculation of the efficiency of the combination, and suggest that a reliable check upon the results given is afforded by computations based on the rise of temperature of the oil. But the heat causing this rise of temperature is, at the same time, communicated to the large surrounding masses of metal, and the heat thus taken away from the oil should be calculated, if possible, or allowed for.

There is another way less open to question for measuring the loss of power due to friction. Let the driven shaft be made the driver at 300 revolutions per minute by a reciprocating engine directly coupled thereto, so that the pinion shall be driven; it will then be easy to apply a brake to the pinion shaft, and ascertain the power transmitted upon a definite basis of comparison with the power exercised on the other shaft.

The results of such a reciprocal test will not merely be "well within reason," but will convince the world. They will certainly be most satisfactory, but below an efficiency of 98.5. G. STRICKLAND.

Perth, Western Australia.

The Safe Knot in Case of Fire.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of May 28th, page 441, is a figure which would be liable to lead to harm if followed in case of fire. The right-hand upper illustration shows a "granny" knot, which is a loose or slipping knot. The one which should be used is the "square" knot, in which the end and strand both pass *below* the loop, or both above it, instead of one above and one below as shown. The square knot will not slip.

F. H. HALL.

[There can be no doubt that our correspondent is correct. The "granny" knot would be unsafe for the serious use to which it would be subjected in case of fire. We therefore publish the foregoing diagram in order to correct any liability to mistake.—EDITOR.]

"Granny"—unsafe "Square"—safe

THE CORRECT WAY OF TYING.

New Cometary Theories.

Neither the comets seen for the first time in 1909, nor the periodic comets of Perrine and Winnecke, which reappeared nearly in their computed places, offers any special interest. Halley's comet reappeared in the position calculated by Cowell and Crommelin. It was first detected in a photograph made by Wolf, at Heidelberg, on September 11th, but was subsequently found on a plate exposed by Keeling on August 24th. Its brightness increased slowly until the end of the year. Its spectrum, first observed in December, showed the absorption bands of nitrogen and cyanogen, with indications of self-luminosity due to incandescent gases.

The past year is marked especially by the results of the retrospective study of the spectroscopic and direct photographs of Morehouse's comet (1908 *C*), which was barely visible to the naked eye. This comet exhibited several divergent bright tails, accompanied by streamers darker than the sky, as if the space surrounding the comet were filled with luminous matter. Subsequently, the tails bent and crossed, and Melotte observed a diminution of brightness at the point of intersection, as if one tail absorbed the light of the other. Several times the tail appeared to break up into knots, which formed new envelopes and moved away from the head with increasing velocity. Comparison of successive photographs showed that the compound tail opened and closed as if the whole structure were rotating about a central axis. The stereoscopic combinations made by Barnard appear to indicate the presence of tails of helical form, but Barnard suggests that this effect may be due to changes of form in the intervals between exposures. Crommelin observes that the apparent rotation of the tails may also be an illusion. It is sufficient to suppose that the head rotates slowly and projects particles rapidly in a plane which follows the rotation. If the tails represent the trajectories of particles, forces emanating from the head and from other points must co-operate with solar attraction and repulsion. The occurrence of four successive outbursts of activity suggests the influence of a medium of variable constitution, formed by particles ejected by the sun and made visible by the passage of comets, either by electrification or by carrying cometary matter with them. This hypothesis would explain the presence of cyanogen and certain other lines in the spectra of nearly all comets. On this theory the apparent boundary of a comet's tail, like that of a flame, would be simply the locus of a change of physical state.

In the spectrum of this comet, E. C. Pickering found six absorption bands corresponding to the principal lines of hydrogen. At Meudon and Juvissy a faint continuous spectrum, indicating self-luminosity, was observed. Deslandres regards the three pairs of bands as doubles, due to the Doppler effect, and deduces for the cometary matter a velocity of more than 1,200 miles per second, but the presence of a strong single line, in addition, leads Campbell and Albrecht to reject this interpretation.

The Current Supplement.

A thoughtful yet popularly written article on Heredity by Prof. W. E. Castle of Harvard University opens the current SUPPLEMENT, No. 1797. The article shows that before any serious attempt can be made to improve the human race, considered as an assemblage of animals possessed of certain desirable physical and intellectual attributes, it is obvious that we must know something about heredity in general and how, in particular, each of the desired physical and intellectual attributes is produced. In his article he reviews briefly some of the problems which the study of heredity presents, and some of the results obtained from their consideration.—Sir William Crawford concludes his excellent consideration of Irish linens and their manufacture.—Shellac or lac is one of those aids to civilization about which there has tended to be an atmosphere of mystery and romance. Mr. G. Clarke Nugent removes much of this mystery in a strictly scientific account of shellac and the lac industry.—A. Roze's instructive article on how to build a profile puppet show is concluded.—A critical consideration of the Mallet locomotive in service is published.—The chemical regulation of the processes of the body by means of activators, kinases, and hormones is discussed by Prof. William H. Howell, of Johns Hopkins University.—Mr. William E. Stark's paper on Measuring Instruments of Long Ago is concluded.—We are very apt to regard the tail of an animal as merely "the other end" of the body, but Nature seems to have early esteemed the member highly, and to have made it her most efficient instrument of locomotion. Many curious facts about these uses of tails are described by Mr. James Newton Baskett.—Mr. W. F. Denning summarizes our knowledge of the planet Mercury.—The usual Electrical Notes, Engineering Notes, and Trade Notes will be found in their accustomed places.

Wanted: Information About Dishonest Patent Schemes.

The SCIENTIFIC AMERICAN has always made a practice of exposing the snares and devices of the patent promoter, as well as the fraudulent patent attorney. Although the subject is by no means new to the readers of the SCIENTIFIC AMERICAN, it is one of which all inventors should be thoroughly informed. The Editor of the SCIENTIFIC AMERICAN would like to receive from readers of this journal, letters in which they narrate their personal experiences with dishonest promoters and attorneys. Such letters will be published in due course, and should not only be of interest in themselves, but should serve as a warning, thereby protecting others against such snares.

Antique Siamese Bronze (Without Bronze Powder.)—This is a greenish-black coating, with inlay of green patina. Rub chrome green and zinc white to a greenish white color with turpentine oil, mix with copal varnish and apply to the object, coating the hollow portions especially. If there is rich decoration, coat this all over and dry. Now rub green cinnabar, graphite, and some black pigment to a greenish-black color with turpentine oil, mix with copal lacquer, and coat over all the raised portions, leaving the hollows untouched, so that the first layer in the hollow portions will have the appearance of copper oxide. Glaze, after drying, with spirit lacquer. Handle the brush just as in ordinary bronzing.

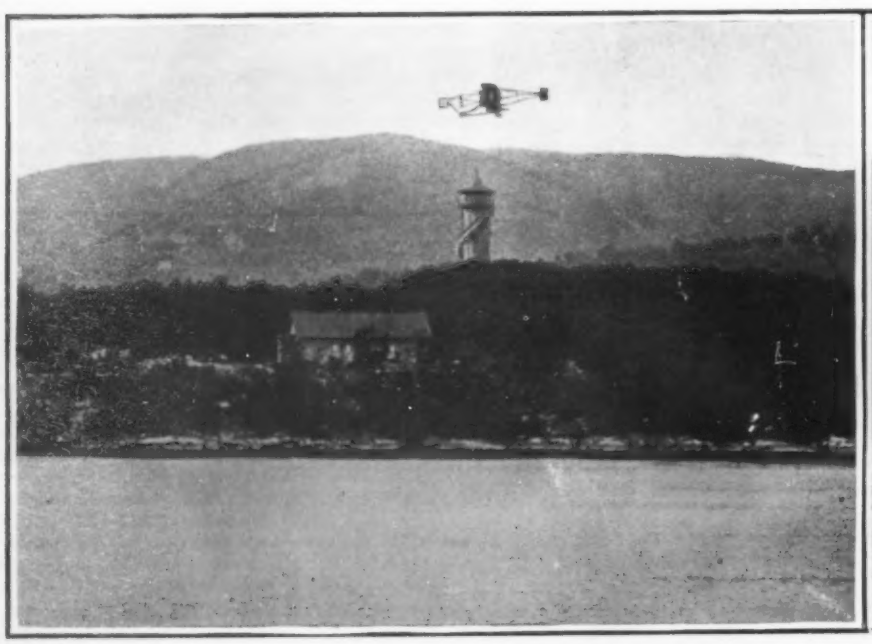
THE ALBANY-NEW YORK AEROPLANE FLIGHT

HOW CURTISS COMPETED FOR THE SCIENTIFIC AMERICAN TROPHY AND THE NEW YORK WORLD PRIZE

OF the three attempts that have been made to fly from New York to Albany, or *vice versa*, the first two were made last fall by dirigible balloons, and were unsuccessful, while the third attempt was made recently by an aeroplane, and resulted in a brilliant prize-winning flight.

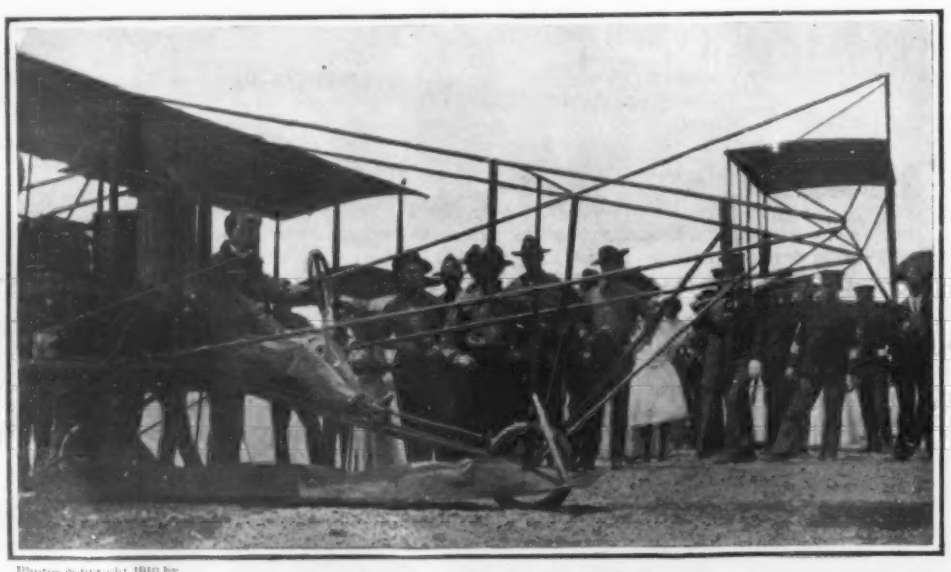
The New York World, which so generously donated a prize of $10,000 last summer for the performance of this feat during the Hudson-Fulton celebration, afterward extended the time within which it could be competed for to October 10th, 1910. Only a few weeks ago, after the exciting aeroplane race of Paulhan and White from London to Manchester, England, for the $50,000 prize of the London Daily Mail, it was decided to amend the rules and permit the making of two stops *en route*, while the time limit for the completion of the trip was set at 24 hours. As soon as the modifications were announced, Glenn H. Curtiss, the first winner of the Bennett cup race in France last year and twice the winner of the Scientific American Trophy, began experiments with a new and powerful biplane at Hammondsport, N. Y., with regard to landing upon water. He had already experimented last fall upon rising from the water, and, although unable to accomplish this, had attained a speed of 20 miles an hour with his small biplane resting on pontoons and driven by its air propeller and 25-horse-power 4-cylinder Curtiss aeronautic motor. It was therefore a comparatively easy matter to fit his new and larger biplane with cylindrical floats and an air-tight canvas bag running the length of the wood strut that connects the front and rear wheels. After making a number of flights over Lake Keuka, at Hammondsport, N. Y., and landing successfully upon the water, Mr. Curtiss shipped his aeroplane to Albany and took a prospecting trip on the steamboat from the capital to the metropolis. He found practically no suitable landing places on the river banks throughout the entire journey. At Poughkeepsie, however, a mile back from the east shore, he selected a landing place on the farm of Mr. W. F. Gill. Upon reaching New York Mr. Curtiss gave notice that he would attempt to win the cash prize of the World and also the Scientific American Trophy for the third consecutive time, which would give him the cup permanently. He then returned to Albany to superintend the assembling of his biplane. This was accomplished in a tent pitched upon Van Rensselaer Island, a mile south of the railroad bridge at Albany. A heavy rain caused delay in assembling the biplane and kept the aviator from starting on Thursday, May 26th, while Friday the flight was impossible of accomplishment because of strong wind. Early Saturday morning Mr. Curtiss went to the island. Everything was in readiness for the flight, and the weather appeared to be perfect, but just as the aviator was about to start a wind sprang up, and he was obliged to again postpone his attempt. Sunday morning dawned bright and clear without any signs of wind, and after waiting till 7 A. M. to see if the wind would increase, Mr. Curtiss started three minutes thereafter. Circling to the north so as to pass within the city limits of Albany just below the railroad bridge, the aviator headed down the river at a 50-mile clip against a wind of 4 or 5 miles an hour velocity. He rose quite rapidly to a height of 4,000 feet, and followed the course of the river for 75 miles to Poughkeepsie. As he came in sight of the railway bridge at this point, he was flying at an elevation of about 500 feet. He increased his height somewhat as he neared this 212-foot-high structure, which he passed several hundred feet above. Three miles beyond the bridge he turned inland on the east side of the river, and landed at 8:26 on the field at Camelot which he had previously selected. The 74¼ miles had been covered in 1 hour and 23 minutes at a rate of more than 53.68 miles an hour. The special train, which started immediately after Mr. Curtiss, succeeded in catching him and in

Just before the start at Albany.



The biplane passing over Iona Island, the government explosives manufactory.

Curtiss planing down the Hudson at 50 miles an hour.



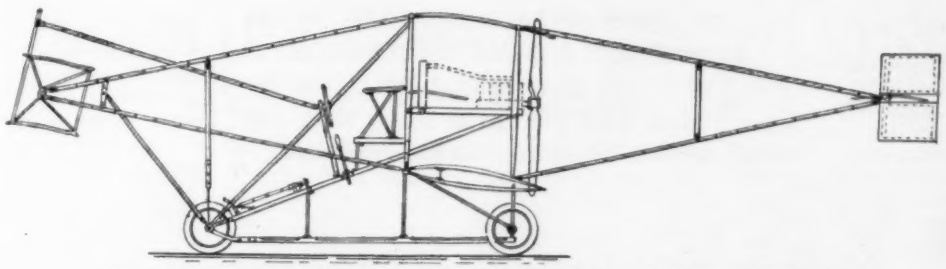
Photos copyright 1910 by Pictorial News Co.

The landing at Governor's Island, N. Y.

keeping parallel with him almost the entire distance to Poughkeepsie. After he landed, however, he was obliged to send for gasoline and oil, in order to replenish the tanks of his biplane before continuing the journey. This necessitated a stop of one hour. At 9:26 A. M. he re-started on his eventful flight and, soaring out over the river, he headed toward New York at a somewhat slower gait than before, owing to the curves and wind. During the balance of the journey, he maintained a height of from 500 to 800 feet. He did not fly as high as during the first part, since, in passing through the Highlands, he found that it was better to fly at a lower elevation. Upon reaching Newburg, Mr. Curtiss could see from the smoke that the wind had changed and was blowing from the west, or directly across his course. As the velocity was not great, however, this did not cause him any uneasiness.

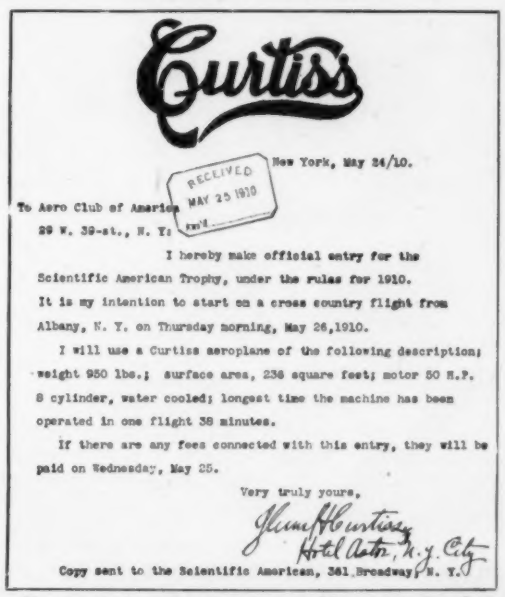
Soon after passing Storm King, the 1,530-foot mountain that juts out into the river just above West Point, the daring aviator experienced a sudden downdraft of air that caused the machine to drop so rapidly that it seemed to fall away beneath him. At the same time, it tipped at a sharp angle to one side, owing to one end catching more of the downward current. With great presence of mind Mr. Curtiss directed his front horizontal rudder sharply downward, in order to gain speed by making a dive and thus to enable his balancing planes to become effective, which, of course, they were not when in a current of air traveling perpendicular to them. This maneuver was successful, and he was able to right the machine. Save for this once, he had no thrilling experiences. He passed over Iona Island, near West Point, as shown in one of our photographs, but for the greater part of his trip he followed the middle of the river. He made a practice, however, of keeping to the leeward side of the river as much as possible. Thus, when Peekskill was reached, and he found that the wind had again shifted so that it was blowing from the northeast, he crossed over to the Jersey side, and followed the stream above the Palisades. When Spuyten Duyvil was reached, noticing what seemed to be a smooth, grassy field, he circled about and retraced his course for a short distance in order to land upon it. He was somewhat amazed, upon landing, to find that what had appeared from his considerable height to be level ground, was in reality a fairly steep incline, so that it was necessary for him to jump out of his machine the moment it came to a standstill, and to hold it from sliding back down the hill. Afterward, when assistance arrived, he pushed the machine to the top, where there was a sharp terrace, and after making a stop of over an hour, he started off this terrace after a very short run. The machine soared off the terrace without dropping to any great extent, showing the possibilities of starting from a cliff.

Mr. Curtiss's second stop was occasioned by the discovery that his lubricating oil was almost gone. By landing upon the north end of Manhattan Island, he would accomplish the flight from Albany to New York with but one stop, while two were allowed. Therefore, so as to make sure of winning the prize, he made the short detour and landed at 10:35 A. M.—one hour and nine minutes after his start from Poughkeepsie. The distance covered in this second stage was, over the course followed, 53¾ miles, so that the speed was 46¾ miles an hour. The remaining 14 miles to Governor's Island was covered in 22 minutes, the second start being made at 11:42 A. M., and his arrival in front of the shed constructed for him last fall taking place a few minutes after noon. On this last stage of the flight Mr. Curtiss maintained a height of approximately 500 feet. He descended rapidly as he neared Governor's Island, and skimmed over the sandy stretch of made land at a height of about 15 feet, almost till he reached the shed. One of our photographs shows him a minute or two after he alighted. At Spuyten Duyvil he left off the two cylindrical floats—one on each side of the machine below the lower plane—and thus these are not to be seen in the photograph. One of the other photographs which we reproduce, however, shows these floats as used at Hammondsport. The cylinders shown in this picture are somewhat larger than those that were actually used, which were about 7 inches in diameter and 7 feet in length. In several of the photographs, showing the biplane in flight, these floats can be seen projecting from the back of the lower plane. Together with the air-inflated bag stretched along the lower runner, they had sufficient buoyancy to keep the machine from sinking should Mr. Curtiss have been compelled to alight in the Hudson. An examination of his machine showed that the oil tank had sprung a leak, and had he not had an indicating gage constantly before him, he would not have known that his supply was rapidly diminishing, and thus he might have had his motor seize.



Side elevation of Curtiss biplane, showing relative positions of planes, rudders, etc.

The Scientific American Trophy, the first prize ever offered for successful flights with heavier-than-air machines.



Curtiss

New York, May 24/10.

RECEIVED MAY 25 1910

To Aero Club of America
29 W. 39-st., N. Y.

I hereby make official entry for the Scientific American Trophy, under the rules for 1910.

It is my intention to start on a cross country flight from Albany, N. Y. on Thursday morning, May 26,1910.

I will use a Curtiss aeroplane of the following description; weight 950 lbs.; surface area, 236 square feet; motor 50 H.P. 8 cylinder, water cooled; longest time the machine has been operated in one flight 38 minutes.

If there are any fees connected with this entry, they will be paid on Wednesday, May 25.

Very truly yours,
Glenn H Curtiss
Hotel Astor, N.Y. City

Copy sent to the Scientific American, 361 Broadway N. Y.

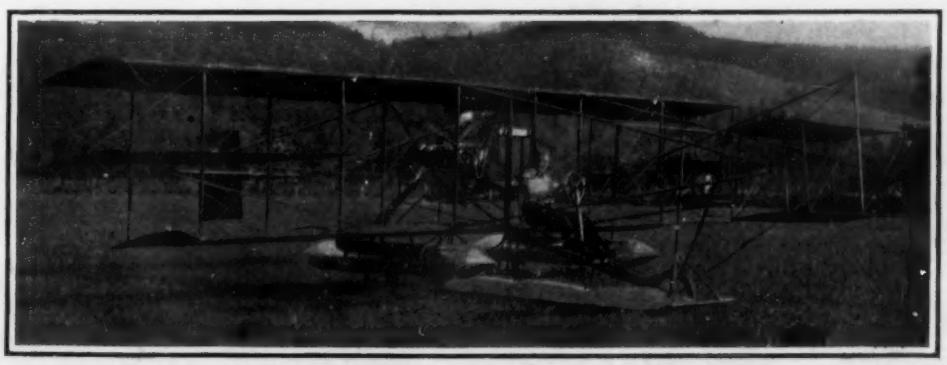
Mr. Curtiss's notice that he would compete for the Scientific American Trophy.

The biplane with which Mr. Curtiss accomplished his epoch-making flight is very similar to the machine with which he won the Bennett Cup last fall at Rheims. It differs from the latter in having somewhat larger rudders and balancing planes, and also in the extension of the upper plane 30 inches beyond the lower plane at each end of the machine. This differential plane idea was first tried a short time ago by Henry Farman, and was embodied in the machine used by Paulhan in his flight from London to Manchester. It tends to give the aeroplane a certain amount of inherent transverse stability. The total supporting surface in the main planes is 236 square feet, and the weight of the machine complete is 950 pounds, including aviator, fuel, and oil. As a result of this the weight carried per square foot of supporting surface is 4.02 pounds. This means that the machine must travel at a speed of 40 miles an hour along the ground before it will lift. In order to attain this speed, a powerful 8-cylinder motor of 50 horse-power is used. The 7-foot diameter, 6-foot pitch propeller mounted upon the engine crankshaft makes 1,100 R.P.M., while the machine is in flight, and gives a pull, when the machine is held stationary on the ground, of over 300 pounds. This is, we believe, somewhat better than the thrust obtained from the Gnome 50-horse-power motor used by Farman and others in their aeroplanes.

The longest flight which Mr. Curtiss had formerly made with his new biplane was a flight of 38 minutes duration above Lake Keuka at Hammondsport, N. Y., in his try-outs of the machine. The greatest care was taken in re-assembling the machine at Van Rensselaer Island, to see that all nuts were properly washered, cotter-pinned, and covered with varnish, so that they would not work loose. Some idea of the strains that must be undergone by a machine in flight can be had when one learns that Mr. Curtiss's biplane was suddenly dropped 40 to 50 feet while in flight, by the downward current of air mentioned, and then quickly made to support itself again by a dive of considerably greater length. One reason for the success that the Curtiss machine has met with is undoubtedly the neat and strong manner in which it is put together. There are no bent struts and loose guy wires, such as we have noted in one of the well-known foreign biplanes that was recently brought to this country; but everything is put together in a thoroughly workmanlike manner, and consequently there have been no accidents.

In making his great flight, Mr. Curtiss also competed for the SCIENTIFIC AMERICAN Trophy, which is to be awarded this year for the longest cross-country flight. The first record for 1910 therefore stands at 74¼ miles, but it is probable that this will be lengthened considerably before the end of the year.

The average speed made by Mr. Curtiss from start to finish of his flight from Albany to Manhattan Island—a distance over the course followed of 128 miles—was 50½ miles an hour. Including the final leg of 14½ miles from 207th Street and the Hudson River to Governor's Island (142½ miles), this average falls to 49.14 miles an hour. The actual air line distance between the starting and finishing points is 136.34 miles, so that using this as a basis, the average speed from point to point was but 47.01 miles an hour, which is the same as Mr. Curtiss averaged in the Bennett Cup race at Rheims. As he no doubt covered more than 136 1-3 miles, it seems his new machine is faster than the Rheims racer with which Hamilton is making flights at Mineola, L. I.



View of Curtiss machine showing pontoons to keep it afloat on water.

THE ALBANY-NEW YORK AEROPLANE FLIGHT.

An Aerial Torpedo.

BY W. G. ASTON.

One of the most remarkable demonstrations of the possibilities of "wireless" has been made in London last month, when Mr. Thomas Raymond Phillips, a Liverpool engineer, conducted a series of experiments on a small scale with a dirigible balloon entirely manipulated and controlled from the earth. These tests were made at the Hippodrome, one of London's largest theaters. Mr. Phillips employed a dirigible on the lines of the "Zeppelin," but only 20 feet long. The model complete weighed about ten pounds and the aerostat was filled with hydrogen.

During the demonstration the inventor stood on the stage of the theater while his machine maneuvered about over the auditorium. He had by his side a keyboard something like that of a typewriter but rather larger, and in reality composed of a number of push switches; above this was a small transmitter similar to that used in ordinary wireless telegraphy. By merely pressing the keys Mr. Phillips showed that he could make his dirigible do anything he liked. He would press a switch over and the machine would promptly rise; the actuation of another key would produce a descent. Forward and backward motion was also obtained with perfect certainty, as well as circular flights and point-to-point voyages, which involved very intricate steering. The experiments lasted some hours, but never once did the model fail to do what the inventor had announced it was about to do. The most effective demonstration, however, was that in which the uses of such a machine in warfare were shown. The car of the dirigible had a trapdoor floor under the control of the operator, who after maneuvering the machine over a certain spot, opened a switch which caused the trapdoor to open and allowed a number of paper bombs to fall down.

The mechanism of the invention is extremely simple, and one that could be made perfectly reliable. In the car of the balloon are a number of coherers suited to different electric wave lengths, and these control small switches which put into and throw out of action two sets of propellers, the trapdoor, and the system of lamps whereby the airship can be lit up when desired. The accumulators for working the propellers and lighting the lamps are carried in the car. The directional control of the airship is effected in a horizontal plane by a pair of propellers hung out from each side of the car on outriggers similar to those of the "Zeppelin." Either or both of these can be driven, and they can also be reversed either singly or together, so that the machine can be steered to the right and to the left, kept in a straight course, or reversed back in its own tracks without turning round.

Two horizontal propellers considerably smaller than the driving screws are also attached by outriggers to the "nacelle," and provide the means for control in a vertical plane. The machine is so balanced as to be approximately equal in weight to the air it displaces; consequently, when the horizontal propellers are not working, it neither rises nor falls, but can be made to ascend or descend by putting them in motion. Thus by using one vertical propeller and the horizontal ones the machine can be caused to move in a spiral path, and by cutting out the vertical screws it can be made to rise straight up.

The switches whereby the machine is controlled alter the wave length of the electricity produced at the transmitter, all the coherer switches on the airship being tuned to different wave lengths.

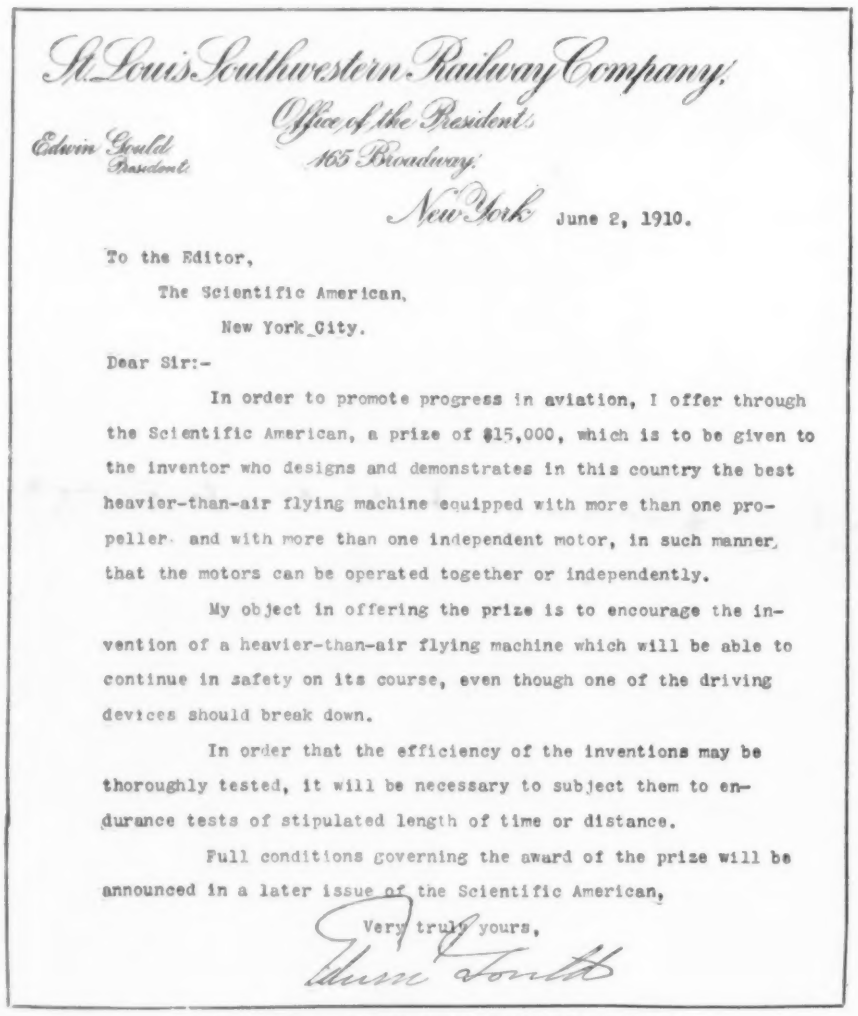
The demonstrations have been so successful that the British War Office have investigated the matter, and it is understood that they have taken the invention up. At any rate, trials with a full-sized machine are shortly to be made, and if these are successful the invention will be bought by the government. The dimensions of the full-sized war machine will be 60 feet long and 6 feet in diameter, and it will be capable of carrying nearly a couple of hundredweight of explosives while its radius of action will be well over 100 miles. Its speed will be about thirty miles per hour.

MR. EDWIN GOULD OFFERS $15,000 TO THE SUCCESSFUL DESIGNER AND DEMONSTRATOR OF A SAFE HEAVIER-THAN-AIR FLYING MACHINE EQUIPPED WITH MORE THAN ONE MOTOR AND MORE THAN ONE PROPELLER.

The fac-simile letter of Mr. Edwin Gould, printed on this page, in which $15,000 is offered for the best successful, heavier-than-air flying machine, driven by more than one motor and one propeller, speaks for itself. It may be pointed out, however, that Mr. Gould, in offering his prize, has been moved by other considerations than those involved in a sporting contest. Races, long-distance flights, speed tests, and other record-breaking performances, have no doubt done much to bring the flying machine prominently before the public; but it must be admitted that, besides whetting the natural human appetite for competition and driving home the truth that the flying machine is destined to play an important part in future human affairs, such contests aid the art but little.

It is Mr. Gould's primary intention to further aeronautic invention, and with that end in view he offers a prize, not for the fastest flying machine, but for a type of flying machine which has thus far not been constructed. Absolute safety must certainly be attained before a flying machine can ever become even a popular vehicle of pleasure, and the attainment of safety is the chief object which Mr. Gould has in view.

The conditions which will govern the novel contest which will be inaugurated by Mr. Gould's magnificent offer have not been decided upon as yet. They will require deliberation. It is hardly likely that we shall be able to publish them for three or four weeks. In the meanwhile, the Editor will gladly consider any suggestions which the readers of this journal may make, so that conditions may be drawn which will be fair and which will best serve the object of the prize.



St. Louis Southwestern Railway Company.
Office of the President.
Edwin Gould, President. 165 Broadway.
New York June 2, 1910.

To the Editor,
The Scientific American,
New York City.

Dear Sir:-

In order to promote progress in aviation, I offer through the Scientific American, a prize of $15,000, which is to be given to the inventor who designs and demonstrates in this country the best heavier-than-air flying machine equipped with more than one propeller and with more than one independent motor, in such manner, that the motors can be operated together or independently.

My object in offering the prize is to encourage the invention of a heavier-than-air flying machine which will be able to continue in safety on its course, even though one of the driving devices should break down.

In order that the efficiency of the inventions may be thoroughly tested, it will be necessary to subject them to endurance tests of stipulated length of time or distance.

Full conditions governing the award of the prize will be announced in a later issue of the Scientific American,

Very truly yours,
Edwin Gould

MR. EDWIN GOULD'S OFFER OF A $15,000 AVIATION PRIZE.

Kinetic energy is the power stored in a moving object which keeps it in motion. By way of illustration, conceive a railway train rushing along a straight, level stretch of track, the train being driven to its power limit. If the source of power, say the steam pressure, is now suddenly removed by closing the throttle, the train will continue to run or "coast," for a long distance, due to its kinetic energy, gradually reducing in speed until the energy is exhausted and the train stops.

Recent Study of the Sun.

The sun can be studied with comparative ease even by the possessors of small telescopes, consequently the announced discoveries are numerous; but astronomers are constantly placing their chief reliance on the statistical results of precise measurements and daily and long-continued observations, and they do not accept the physical theories advanced until after a long period of probation. Even data which have been admitted and used for many years are not exempt from criticism. Thus, the elements of the sun's rotation determined by Carrington fifty years ago, which are still used in the reduction of the photographs taken daily at the English observatories, have been called into question. Turner has examined the measurements made by Peters between 1860 and 1887, which fill the gap between Carrington's work and the Greenwich photographs. He reaches the surprising conclusion that the sun spots of the northern and southern hemispheres revolve about two different axes, which make with each other an angle of 6 minutes,. The spots appear to be affected by a general drift which changed direction about 1885.

The hypothesis of a planetary influence on sun spots has been often discussed and generally rejected. In its favor, however, may be cited the proved fact that the last maximum in the number of spots which was announced for 1905, was delayed nearly two years, and that this retardation had been predicted by Brown as a consequence of the motions of Jupiter and Saturn.

The solar activity gradually decreased in 1909, as had been expected. Nevertheless, a group of spots remained visible from November, 1908, to April, 1909. The group which appeared in September, 1908, was found to be connected with a violent magnetic storm. Lockyer's photographs made with the spectroheliograph, show that the principal spot was gradually obliterated by clouds of calcium which exhibited a cyclonic structure thirty hours before the maximum of magnetic disturbance. Mitchie Smith observed that an extraordinary outburst of activity in the same spot, was quickly followed by violent and prolonged agitation of the magnetic needle. This group of spots affected the earth's magnetism in four successive revolutions, in two of which it produced two disturbances at intervals of five days. This fact suggests the influence of two limited and divergent beams, analogous to the double tails of certain comets.

The tendency to recurrence at intervals of 27 or 28 days, is well established for magnetic storms and auroræ. The question has been asked whether other terrestrial phenomena do not similarly show the influence of the sun's rotation. From the records of cyclones in the Indian Ocean, Maunder finds that an interval of 28 days is of common occurrence.

The first results of the total eclipse of 1908 have been published. The report of MacClean's expedition say that the corona exhibited the character, usual at intermediate epochs, of great extent in the middle latitudes, but that it was distinguished by certain features from all previously observed coronas. The coronal rays or streamers showed no connection with the protuberances.

The United States during February produced pig iron at a rate which equaled 31,650,000 gross tons per annum. During January the rate was about 31,000,000 tons, and in December about 31,450,000 tons. In commenting on these figures, the Iron Age considers it is questionable whether the February rate will be maintained during March, since the daily capacity of coke and anthracite furnaces in use at the beginning of the month was 84,854 tons, whereas the daily rate of production for February was 85,616 tons. "It is hard to realize," the journal remarks, "that in February the production was more than 40 per cent above that of February of last year, and nearly 2 1/3 times that of February two years ago, and yet that so little metal is pressing on the market. . . . It is not surprising that a question is raised of the ability of the country to absorb pig iron at the present rate throughout the year."

DR. ROBERT KOCH, THE FATHER OF PREVENTIVE MEDICINE

BY JOHN B. HUBER, A. M., M. D.

Dr. Robert Koch died on May 27th last. To estimate the value of his work, we must consider how humanity suffered from disease before his time.

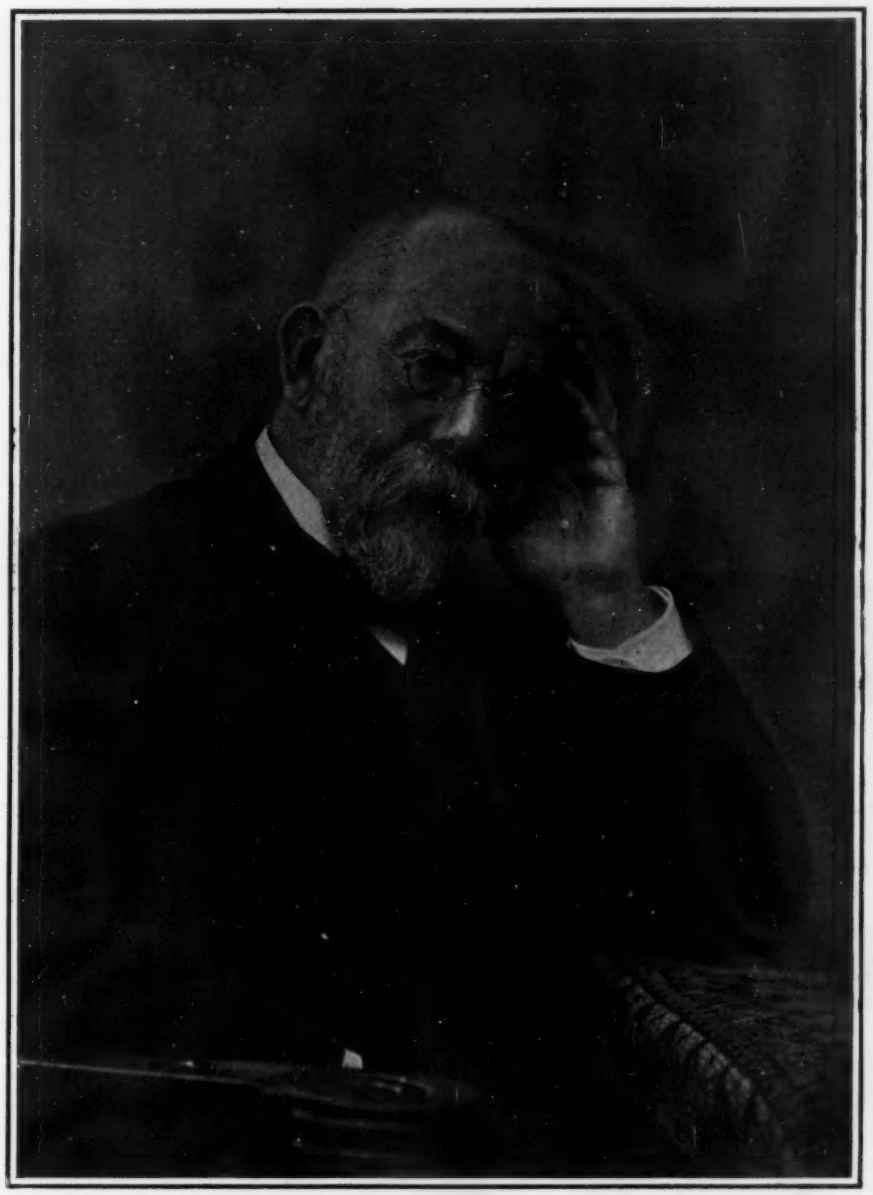
Before the beneficent inoculations of Jenner, epidemics of smallpox devastated vast regions, decimating cities and wiping out whole towns and villages. Nearly every wayfarer one met was a pock-marked survivor. The dreadful history of the bubonic plague is lost in the mists of antiquity. To go no further back—an epidemic of it was the last of those seven plagues that afflicted Egypt. Those 50,000 Israelites and Philistines at Beth-Shemesh; and those 70,000 others were destroyed by the microscopic *Bacillus pestis*. Before and since the Trojan war (in which this germ did its greatest execution), throughout the middle ages, and indeed up to our time, scores of epidemics of the bubonic plague have wrought ghastly havoc. One of these, the Black Death of the fourteenth century, destroyed most miserably (so Gibbon computed) one-fourth the population of the then known world.

Malaria, though not so death-dealing an agency, has nevertheless dreadfully affected the *morale* of humankind. To cite but the one historic instance given by W. H. I. Jones of Cambridge: As is so often the case in history, the conquering Greeks under Alexander were conquered by the India they invaded; and its weapon was one much more potent than the sword—it was the microscopic malaria plasmodium. Upon its inroads the Greeks began to "lose much of their intellectual vigor and manly strength."

Consider finally tuberculosis — consumption — which has probably always afflicted mankind. At any rate, Hippocrates, twenty-two centuries ago, wrote of it as the disease which above all others caused the most suffering and the greatest number of deaths. The dreadful infections here mentioned, though more gruesomely picturesque in their ravages, have been dwarfed by consumption. In the nineteenth century fourteen millions died in war, by bullet and steel and camp diseases; during the same period, thirty millions succumbed to consumption. From time immemorial every third or fourth adult—in some communities every other adult—has succumbed to insidious phthisis. We whites have introduced this disease among negro "brethren," who die of it in greater numbers than we do; and among our Indian "wards" who are fast disappearing by reason of our tuberculosis, aided and abetted by our "fire water." Who has not, either in his family or among his friends, had to endure some experience of the "Great White Plague"? Think of it! Between adolescence and the fifty-fifth year, in those years when young men and young women contemplate marriage, when wives should be strong to rear their children, when husbands should be strong to maintain their homes, when we should be strong to do the world's work, in those most precious years tuberculosis has throughout the centuries been claiming every third or fourth of our race. Consider how often the wage earner has first succumbed; and how, through the many months and the years of this chronic disease, his family must endure the privations imposed by it, and oftentimes in turn themselves become its victims. The world, moreover, has lost treasures immeasurable by reason of the untimely sacrifice of men and women of genius to tuberculosis, "death's direct door to most hard students, divines, physicians, philosophers, deep lovers, zealots in religion." Tuberculosis has ever been at least as great a devastating social and economic factor as it had been a death-dealing infection; every year our nation alone has been sustaining by reason of it a monetary loss of more than a thousand millions of dollars.

Reflect upon all these things; and then turn the mind to the year of Koch's birth—1843. In that year Pasteur entered the university.

And let us premise here that in science great names are landmarks; and the owners of these names have traversed and gleaned in the fields where many a devoted and now forgotten laborer has delved and sown and perhaps sweated blood. It should indeed be a comfortable observation that in science at least no man works in vain. Full many a one has given his whole life to establishing a fact, or indeed only an item to a fact; his industry unrecognized, ridicule and even persecution oftentimes his only compensation, living perhaps in the pitifulest destitution; yet his life and his works have been absolutely essential to the universal scheme. There is the human unit; and there is the welfare and the very existence of the race, which latter were impossible without the self-abnegating labors of the individual.



DR. ROBERT KOCH.

Nor does it in any wise detract from the gratitude due the great man, that he had profited by the labors of others, adding what he can of his own, scrutinizing every detailed datum in the whole fabric, permeating and illuminating it with his own mind, and extracting from the mass the mighty deductions of genius. Thus did Jenner's inoculations, upon the principle of fighting fire with fire, make clear the way for Davaine and Lister and Pasteur; upon whose substructure Koch built. These latter developed the germ theory of disease; Koch made of this theory the science of bacteriology, which is to-day the most potent factor in civilization. Pasteur declared it to be within human power to banish all parasitic diseases from the face of the earth; Koch clearly demonstrated how this business was to be gone about.

When Koch was seventeen he persuaded his father to get him a microscope. Possessed of this most congenial companion, he set about perfecting other technical means of investigation. For even genius cannot work effectively without good tools. After attaining his doctorate in medicine he became a simple country doctor, utilizing the time which—mournful to relate—every beginner in practice has a plenty, in scientific study, experimentation, research, and writing. In those years he laid all the foundation of his future greatness. At that time he was not enrolled in any world-famous institution, nor had he millions at his back. Such aids to success are not to be decried; yet it is amazing how frequently genius, burning unquenchably in the service of humankind, has managed to get along without them, how they never avail at all in the absence of the right man.

But soon the German government became cognizant of Koch's writings. That government recognizes good work; it avails itself of ability; it engaged Koch in its service.

It 1882 came his truly epochal discovery of the tubercle bacillus, the essential cause of tuberculosis. Here was laid down the sure and scientific basis of the anti-tuberculosis propaganda which has since been so successfully waging. Upon this foundation were preventive measures intelligently formulated, and with wonderful result up to our day. In Prussia (Koch's own country) the consumption mortality has been reduced forty per cent; in Boston, forty-five per cent; in New York city, fifty per cent; in our northern cities, twenty per cent in the years of 1901-6. And it is being confidently predicted, on the basis of the prophylaxis thus far achieved, that our children—yes, even we in this generation—may see this dreadful scourge of the centuries all but eliminated from human experience. Koch elaborated various tuberculins diagnostic of tuberculosis; their curative properties have unfortunately proved disappointing, yet they were the basis of the wonderfully effective antitoxins of diphtheria, tetanus (the most agonizing of all diseases, of which formerly nearly all the sufferers died), meningitis, pneumonia, and other dreadful infections.

And Koch's achievements in tuberculosis were only a part of his service to mankind. In 1884 he discovered the cholera bacillus, which is responsible for that disease. In the investigation of other world scourges—cancer, bubonic plague, septicæmia (blood poisoning), trypanosomiasis cattle plague, anthrax, malaria—Koch's part has been most vital, either as discoverer or as originator or developer of prophylaxis and curative methods.

He showed how malaria could be absolutely vanquished by stamping it out of the island of Brieni, in the Adriatic, under commission of the Austrian government. In Bombay he studied the bubonic plague at first hand. When long past threescore he repaired to a desolate island in Victoria, Nyanza, his only white companion being an army surgeon; and throughout the whole of eighteen months they together saw but three other whites. A rough canoe, hewn out of a single log, was their only means of communication with the mainland. There Koch discovered the crocodile's blood to form the chief nourishment of the tzetze fly, the blood-sucking insect that transfers the

(*Concluded on page 490.*)

The Collection and Preservation of Moths and Butterflies

BY FREDERICK M. SCHWERD

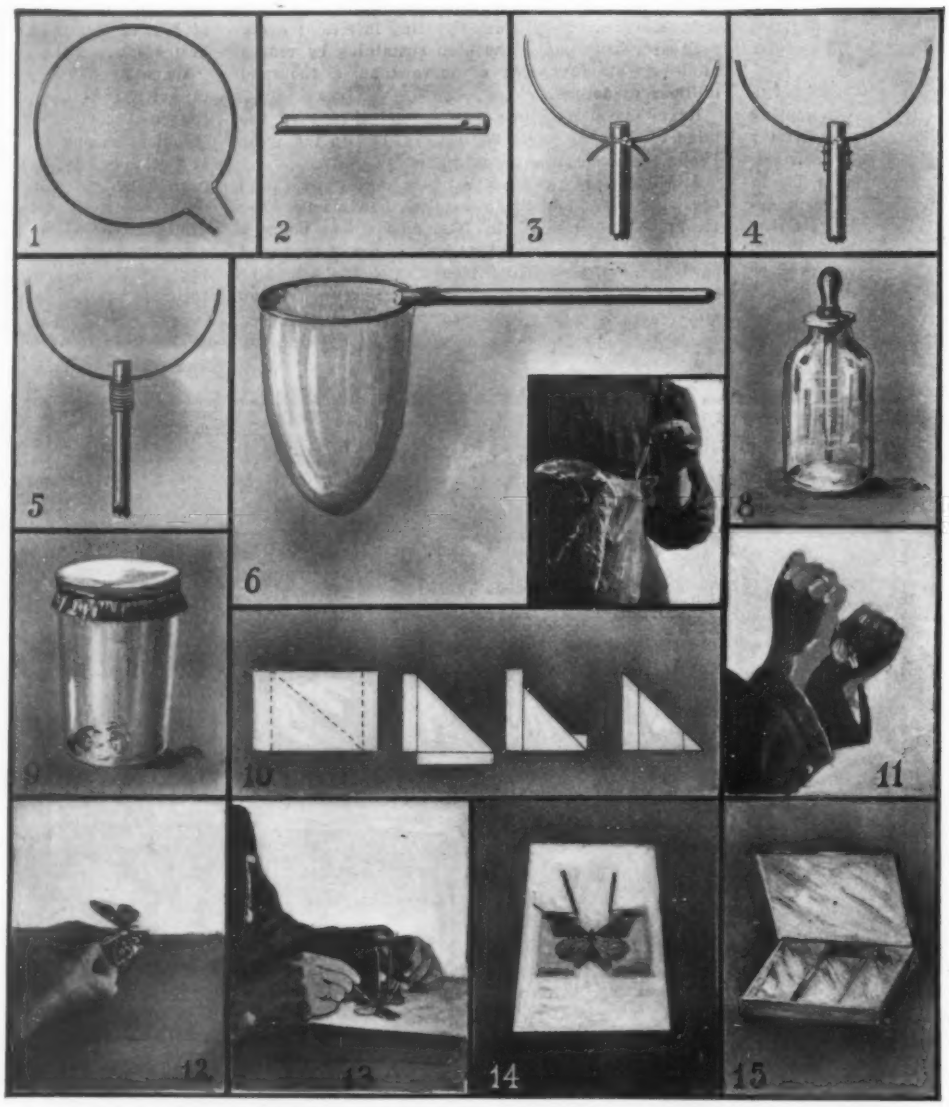
The most beautiful members of that very large zoological class termed insects are butterflies and moths. Because of their beauty they have always received more or less attention from collectors, young and old. Many have started to gather these insects, but because of lack of the knowledge of how to preserve them, their so-called collections have spoiled, and the specimens have become broken and moth-eaten. In the following words I shall endeavor to describe, without the use of scientific terms, a method in which to preserve their captures, and which gives such pleasing results that the finished labor will be a source of enjoyment, both to the collector and his friends.

The specimens must be caught before being preserved; therefore, it will be most convenient to begin with a description of the primary requisite for this work.

The Net.—The frame or rim of the net is easily made from a piece of iron or telegraph wire about forty-two inches long. This wire is bent in the form of a loop, leaving two straight ends, each about four inches long, in the manner shown in the illustration 1. Some sort of rod must then be secured, to serve as a handle. A broom handle answers this purpose very well, but a rod about an inch in diameter and five feet long can be procured at any lumber yard for a few cents. Through this rod about half an inch from the top a hole is drilled, as shown in Fig. 2. The straight ends of the wire are pushed through this hole, one from either side. The projecting ends are fastened against the handle with staples or wire wound around. (See Figs. 3, 4, and 5.) Only the making of the bag remains. For this purpose tarletan or other fine netting of a brown or green color should be used. Mosquito netting is rather coarse and should not be used, as it scratches the wings of the insects. The bag should be about twenty inches deep and the bottom rounded as in Fig. 6. It may then be attached to the rim by means of tape.

How to Kill the Insect.—When the insect is fluttering in the net, the question arises how to kill it painlessly and quickly. This may be accomplished in several ways. Most collectors use a cyanide bottle, which is prepared in the following manner: Into a wide-mouthed glass are placed a few lumps of cyanide of potassium. Upon these is poured plaster of Paris to the depth of one inch. When the plaster is dry the bottle is tightly corked, and must not be left uncorked. The body of the insect is gently held between the thumb and index finger (7) and a drop of chloroform is dropped upon its head from a vial carried in the pocket. The insect immediately stops its fluttering, and may then be taken from the net and placed

(*Continued on page 490.*)



1, 2, 3, 4, 5, and 6 show the details of net and frame. 7. Chloroforming an insect. 8. Medicine dipper. 9. Glass for holding dying insect. 10. Envelope for preserving dead insects. 11. Pushing pin through a specimen. 12. Bending wings into horizontal position. 13. Pinning insect to a board. 14. Insect between glass pieces before mounting. 15. Insect mount, showing glass shelf.

COLLECTION AND PRESERVATION OF MOTHS AND BUTTERFLIES

BERTILLON AND THE BURGLAR'S "JIMMY"

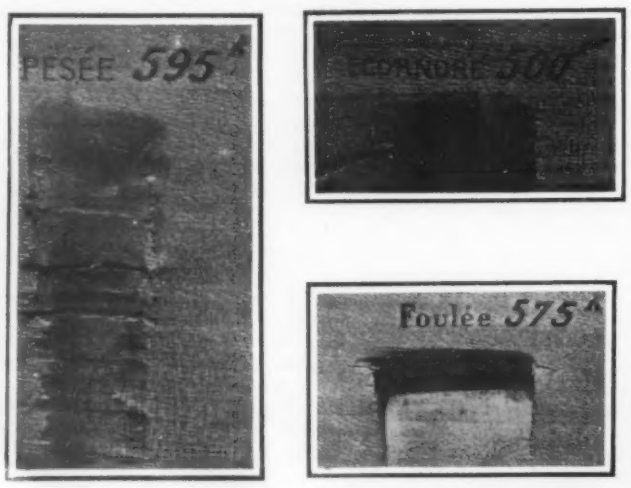
BY JACQUES BOYER

The police officer or magistrate engaged in the elucidation of a crime, endeavors to collect as many exact facts as possible, and the more methodically he seeks, verifies, and gives a logical grouping to his evidence, the greater is his chance of discovering the true cause and the perpetrator of the crime.

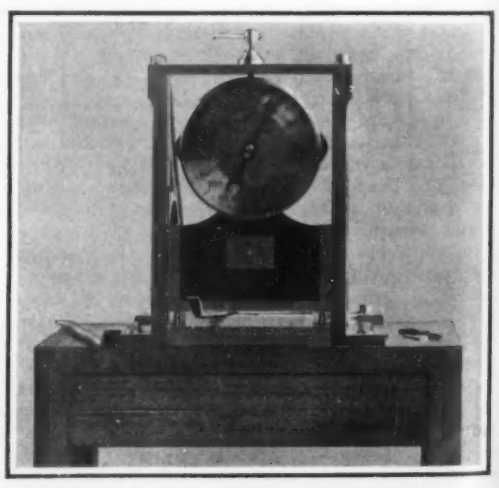
M. Bertillon, the celebrated chief of the anthropometric service of the French police, has recently invented a dynamometer of special character, which will facilitate judicial investigations by furnishing exact measurements of the muscular efforts which are manifested in the violent entry into a house, room, or desk, and by making it possible to reproduce the traces of his work which the burglar has left on doors and articles of furniture. The apparatus consists of a steel frame, which is attached by screws to a wooden table. It contains a lower plate which can move forward and back, two lateral uprights stiffened by curved braces, and a cross piece of steel attached by strong bolts to the tops of these posts. This frame carries

(*Concluded on page 491.*)

The Bertillon effraction dynamometer—a mechanical detective.



Impressions of the three fundamental types, showing the force in kilogrammes required to produce each.



The Bertillon effraction dynamometer which records force required to use a "jimmy."

A MECHANICAL BURGLAR DETECTOR.

GAS WATER HEATER FOR KITCHEN BOILERS.

BY JOHN A. BERGSTROM.

One of the chief drawbacks of the gas kitchen range is the problem of maintaining a suitable hot water supply. A small heater attached to the kitchen boiler will overcome this trouble. The accompanying illustrations show how such a heater can easily be made and connected at a very small expense. It will only take a few minutes to heat enough water for a bath or for washing dishes or clothes. As the hot water rises and stays at the top of the boiler until drawn off at the faucet it is not necessary to heat all the water in the boiler, as is the case when it is connected with the kitchen range in the usual way, but only such amount as may be required for the time being. The heater as illustrated in the vertical section, Fig. 2, and cross section, Fig. 3, consists of a copper coil, inclosed in a casing, with a gas burner in the center of the coil, and it is connected to the kitchen boiler at the top and bottom. The gas burner can be made with or without a primer or lighter. It can also be connected with a self-lighter to be operated with a push button in the usual way.

Take an ordinary tinned copper tube about one inch in diameter, and fill it with fine sand, closing the ends with stoppers. With a wooden mallet begin about 3 inches from each end to flatten the pipe, until it is ¼ inch in thickness. After this, make a wooden center, say 6 inches in diameter, with one end tapering or rather rounded off. One end of the tube is now fastened to this wooden center, and the flat pipe is wound around the same, forming a close helix. The other end is then formed over the tapering end of the wooden center by hammering it into place with the mallet, until the coils begin to close up, leaving enough space for the spent gases to pass out. The end must of course be made straight and in the center so that it will enter the central hole in the casing or cover which is to be connected to the boiler.

After the coil is made into the required shape, the stoppers in the ends are removed, and the sand made to run out by turning the coil around and tapping it lightly with the mallet. It may then be connected to a faucet and washed out with water. The lower end of the coil may be bent at any angle to suit local conditions.

The externally threaded end of an ordinary ¾-inch union is now slipped over the end of the coil which is peened over, say about 3/16 inch, forming a flange which serves to connect the copper tube and iron pipe with the ordinary union. (See Fig. 4.). This should be done at each end of the coil. Of course the heads of the casing should be put on before the unions are fastened to the coil. The coil is now inclosed in a sheet iron casing (a piece of 8-inch stove pipe) with a layer of asbestos between the coil and casing.

The top of the casing is connected to the chimney or the atmosphere with a small pipe, to carry off the spent gases. If connected with the outside atmosphere, a suitable cap or hood should be provided at its outer end so that the wind will not blow through it and extinguish the fire.

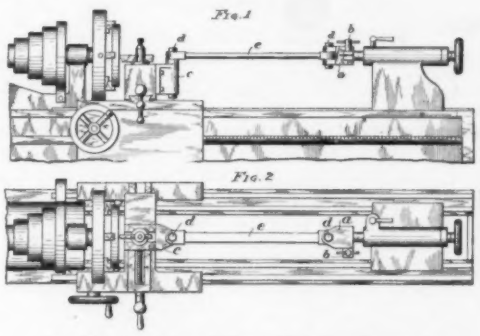
The burner is made out of an ordinary nipple, with caps on each end. In the nipple are drilled a number of small holes. Inside the nipple is a small iron cylinder with conical bottom, and provided with a small flange at its upper end, where it is fastened between the end of the nipple and the cap. The object of this cylinder is to partly fill up the inside of the nipple, leaving a small annular space for the gas and air to pass up and out through the small holes in the nipple. To the lower head of the casing is fastened an ordinary air regulator, into which the gas pipe is secured, forming an ordinary Bunsen burner.

The main feature of this heater is to introduce the water in a very thin, circular sheet surrounding the central heater. It will now be seen that when the gas is lighted the water in the flat coil becomes hot and starts to circulate around the fire up the spiral course to the top of the boiler. The temperature of the water may be regulated by inserting a valve below the coil, but for ordinary use this is not necessary.

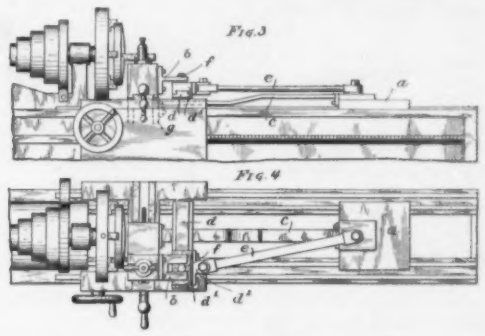
Fig. 1 shows the complete heater connected up to a kitchen boiler with a vent pipe for the spent gases connected to the chimney.

Fig. 5 shows how the heater may be fitted up with a primer, or starter for the gas, which is merely a small independent Bunsen burner, connected below the regular mixing tube. This burner is first lighted; the flame will shoot up into the heater; the ordinary gas-cock is then turned on and the gas ignited, when the primer may be turned off. This is only a matter of convenience in starting the big burner, as a match or a taper will do the same thing.

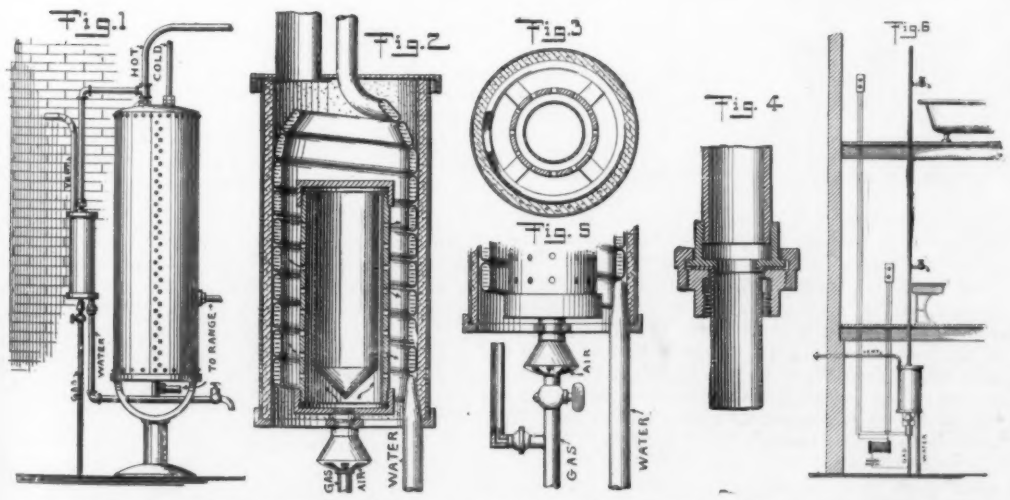
Fig. 6 shows a system in which the heater proper is located in the basement and the supply pipe, instead of being connected to the boiler or storage tank, is controlled independently from each floor. The heater is equipped with an electric self-lighting apparatus, such as may be purchased in the market. An ordinary "off and on" push button is placed at each floor, near, or it may be connected to the water faucet. The apparatus is quite simple, it is only necessary to push a button, which will ignite the gas in the heater, and then open the faucet. The cold water in the pipe will run out, of course, before the hot water makes its appearance. The temperature of the water can be regulated by the faucet. That is to say, the greater the heat desired, the smaller should be the quantity allowed to run through the faucet, and *vice versa*. When no more hot water is wanted the other button is pushed, which cuts off the gas and puts out the fire in the heater, and the faucet is closed. This operation may be repeated any time hot water is wanted. If cold water is wanted, it is only necessary to turn on the faucet, without starting the fire. Thus hot or cold water may be drawn from the same faucet at will.



SIDE AND PLAN VIEWS OF RIG FOR CUTTING A CONCAVE SURFACE.



LATHE RIGGED TO TURN A CONVEX SURFACE.



GAS HEATER ATTACHED TO THE BOILER. VERTICAL SECTION OF THE GAS HEATER. DETAILS OF THE PRIMER AND THE COUPLINGS. BASEMENT WATER HEATER.

TURNING CONCAVE AND CONVEX SURFACES.

BY E. B. UTERSTAEDT.

Some time ago the writer had occasion to make a pair of laps for grinding telescope lenses, and as this calls for very accurate work in order to get a true curve, it became necessary to make the attachments which are here described. In this class of work, it is imperative that the utmost care be given the construction of the several parts, as upon the accuracy of the measurements and nicety of fit depend the quality of the finished product. There must be no lost motion anywhere, as this would mean chatter marks on the surface of the work. For this reason it is better to use taper pins or bolts as these will insure a close fitting joint, and the extra trouble will be more than repaid. The rigidity of the radius bar is of vital importance; it is far better to have it too heavy than too light. Nothing is better than a good cast iron bar; for it is less apt to spring than steel. For radii of 15 to 24 inches, a bar ¾ by 1½ inch cross-section is none too heavy, while for radii of 24 to 36 inches ⅞ by 2 inches is of about the proper proportion.

Figs. 1 and 2 show front and plan views respectively of the concave attachment. The radius block *a* is bored to make a close fit on the nose of the tail-stock spindle, and is provided with a tightening screw *b* for binding the block securely in place. It will be observed that the block is split where the tightening screw works. The lugs or ears which receive the radius bar *c* are now finished on the inside, and the holes for the pin or bolt *d* are drilled. Care should be used to get these holes directly in line with the dead center; it may appear that a slight variation one way or the other may be of no account, but it is. A good mechanic always adheres to the rule, "Anything worth doing at all is worth doing well." The block *C* is secured in any suitable manner to the tool-post slide. As this part of various makes of lathes differs it is impossible to give a form of block to fit all, but any good mechanic can devise means for securing one to his lathe. Regarding the radius bar *c* little can be said except the spacing of the holes. On the accuracy of this depends wholly the accuracy of the curve of the part machined. Fig. 2 shows the tool on a line with the center, in which position it is set before starting to cut. The tail stock is now clamped in position, while the lathe carriage should be free to move back and forth on the ways. As the tool post slide is drawn toward the operator, the carriage will be drawn back, causing the cutting tool to describe an arc the radius of which is equal to the distance between the centers of the holes in the radius bar. The tool is fed to the work by turning the hand wheel of the tail-stock screw, while the cross feed is accomplished in the usual manner.

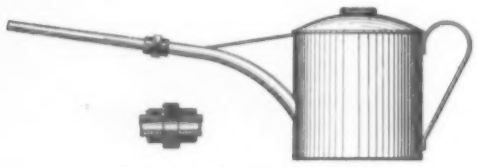
Figs. 3 and 4 represent the device for turning convex surfaces, which is somewhat more complicated than the mechanism described above. The radius bar used for concave work can be used here, but all of the other parts must be made especially for the purpose. The block *a* must be planed and fitted to the inner ways of the lathe and mounted in such a manner that it can move freely backward and forward. The slide *d* which carries the cross-slide block d^1 is securely bolted to the lathe bed. Bolted to the sliding block d^1 is the bearing d^2 to which is secured the forward end of radius bar *c*. On the upper side of block d^1 is a roller which runs in the slot in block *b*, the latter being secured to the tool-post carriage. The lathe carriage and block *a* are rigidly connected by means of the bar *c*, the front end of which may be bolted to the bridge webs as shown by the dotted lines. The operation is as follows, bearing in mind that slide *d* is rigidly secured to the bed. As the tool-post slide or cross slide is fed forward, the sliding block d^1 is carried with it by means of the slotted block *b* and roller *f*. As sliding block d^1 advances carrying with it the forward end of radius bar *c*, it becomes apparent that block *a* must move backward, and as this block and lathe carriage are rigidly connected by bar *c* the lathe carriage will be carried with it, the result being that the tool is caused to move in a reversed arc. It might be well

to state that in order to avoid resetting, it is a good plan to have the blank which is to be machined cast with a convex face of about the same curve as it should be when finished. If this is not done or we wish to use flat disks of cold-rolled steel or other metal, it will be necessary to move the cutting tool forward after each cut.

A SAFETY OIL CAN.

BY A. J. JAHMAN.

When oiling electrical machinery, it is always advisable to safeguard yourself against accidental shock, especially when currents of high tension are being



OIL CAN WITH INSULATED TIP.

generated. It frequently happens when an ordinary long-spout can is employed for oiling dynamos that a severe shock is received by the oiler, resulting sometimes in death. Several years ago the writer invented an oil can that was perfectly safe under all ordinary conditions of use. Owing to the extreme simplicity of the design, any one possessing ordinary mechanical ability can convert an ordinary oiler, either of the vertical or horizontal kind, into a safety oiler. Cut the spout in the middle and solder upon each end a piece of brass tubing having either an external or internal thread cut. Fit thereon a coupling sleeve made of insulating material as shown in the sectional view. The insulator can be made out of either hard rubber or vulcanized fiber turned in the lathe, with a milled center to admit of a firm grip when screwing or unscrewing the parts. Since oil is an insulator, no current can get past the coupling sleeve to the oiler's hand.

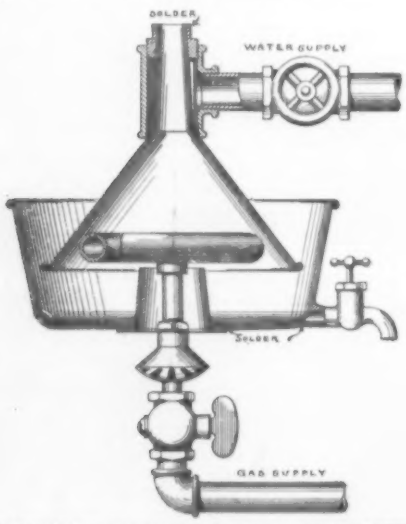
INSTANTANEOUS WATER HEATER.

BY GEORGE M. PAGE.

The old proverb, "A watched kettle never boils," does not apply to the water heater shown in the accompanying illustration, because hot or even boiling water can be drawn from it the instant it is put into operation. It is made from an ordinary copper funnel and a cake tin.

The copper funnel should preferably be tinned on the outside. To the water supply pipe is attached a valve for the regulation of the flow of water. To this valve is fitted a short nipple and an ordinary tee fitting. One end of the arm of the tee is fitted with an ordinary plug which is bored and reamed out to fit the small end of the funnel, and the end of same is turned over with a small hammer and soldered to the plug. The other end of the tee is filed to fit very closely to the outside of the funnel, leaving, however, a slight annular opening which may be regulated by screwing the plug in or out, so that when the water is turned on it will flow in an even thin sheet over the funnel.

Inside the funnel is an ordinary gas burner, such



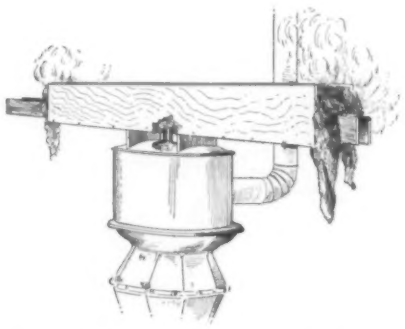
HOME-MADE INSTANTANEOUS WATER HEATER.

as may be purchased for ten cents. This burner is connected to the gas supply in the usual manner. It will be noticed by referring to the illustration that the funnel is in an inverted position. The lower part of the funnel is surrounded by an ordinary cake mold, with the inside cone partly cut off. This tin forms a basin for the hot water, which may be drawn off with an ordinary faucet soldered to the cake tin, or it may be run off as the water heats. It will now be seen that when the gas is lighted the funnel becomes hot at once, and when the water is turned on it is forced through the narrow opening between the tee and the funnel in a uniform thin sheet which spreads over the funnel and becomes hot as it flows down. Almost any degree of heat may be obtained by regulating the flow of water with the valve. The spent gases from the gas burner pass up through the funnel and out to the atmosphere. Some arrangement may be made to connect the water and gas valves so that they will be turned on simultaneously, thus obviating the danger of overheating the funnel.

STEAM BOXES FOR BOAT BUILDING.

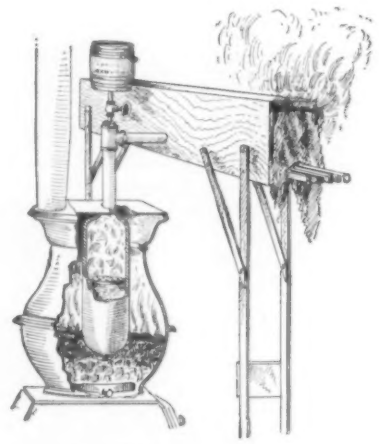
BY A. F. BISHOP.

A simple method of rigging a steam box for boat work is as follows: Take a common wash boiler, put a 1¼ inch hole in the cover to receive a short piece of tubing 2 or 3 inches long, which should be soldered. The steam box is made of wood, of any length desired, and about 10 inches high by 8 inches wide inside. Make a couple of chocks hollowed out to fit the top of boiler cover, and nail them to the box. Cut a round



STEAM BOX CONNECTED TO A WASH BOILER.

hole in the bottom of the box to receive the tubing that has been placed in the cover of the boiler. Be careful not to allow the tubing to project inside the box. The ends of the box are generally stopped up with old rags. In operation put about a pailful of water in the boiler, fit the cover on, and then lift the



STEAM BOX CONNECTED TO A CAST-IRON MUFFLER.

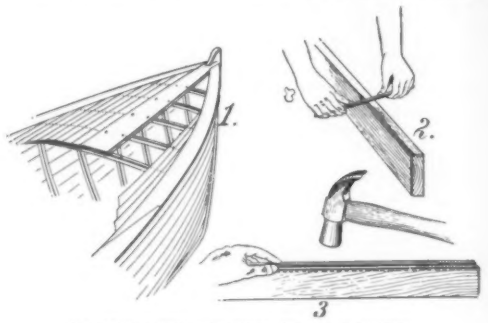
steam box and place it on top of the cover, allowing the tubing to enter the bottom of the box.

Another method of constructing a steam box has been devised by William Ells, a boat builder. It is made by taking a cast iron muffler, plugging the lower end, and connecting a short length of 1¼ inch pipe to the opposite end. A tee is put on the end of the pipe with a short piece of 1¼ inch pipe screwed into the tee at right angles to the muffler piece. The upper end of the tee is plugged up with a wooden plug, if there is no reducer handy.

Bore a hole in the wooden plug, and screw into it a short piece of ¼ inch pipe, fitted with a stop cock of some sort. Above the stop cock, place a can or wooden paint pail, which is quite easily attached by simply boring a hole in the bottom and screwing to the short nipple above the stop cock. In operation, the muffler is placed in the stove with a coal or wood fire. A piece of sheet iron with a hole through which the pipe projects, serves as a cover for the stove. Water is poured into the paint pail and allowed to run down into the muffler as desired. A wooden steam box mounted on legs is connected to the muffler by the 1¼ inch pipe. This style of boiler is not injured if it boils dry, and is frequently red hot when the water is put in. This, of course, makes it "flashy," but otherwise no harm is done, as the pipe is of sufficient size to handle all the steam that is generated.

MAKING TIGHT JOINTS IN BOAT DECKS.

A boat deck is more exposed to severe attacks of the elements than any other part of the boat. The hot sunshine may be drying it up half the time, while during the other half, it may be covered with rain, dew, or salt water. And on this account the majority of boat builders calk the seams, which does not make



MAKING TIGHT JOINTS IN BOAT DECKS.

as pretty a deck as a tight seam, made in the following manner:

Have the wood thoroughly seasoned and make a nice fitting joint for the deck plank that you are laying next to the plank sheer. When this is done, take the piece out and with a smooth steel rod or burnisher of some kind, burnish down, with quite a pressure, the corner of the jointed edge, as in Fig. 2 of the accompanying drawing. This of course compresses the wood. Now plane the wood down on the jointed edge, making a true corner again. This is now ready to fasten on the deck carlins. Proceed in like manner with the rest of the deck planks. The joints on a wooden tank or vat can be made tight by the same principle. Instead of burnishing the corner a round rod is laid in the center of the jointed piece and with a hammer is forced nearly half its diameter in the wood. (See Fig. 3.) This is planed down until there is no groove left; each joint is treated in the same way. When the wood is moistened, the part that has been compressed by the round rod will expand. This produces a very tight joint.

TO PREVENT OBSTRUCTION OF THE FEED PIPE IN AUTOMOBILES.

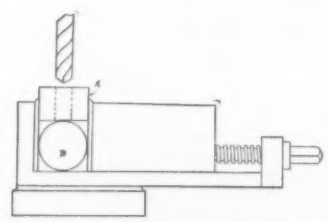
BY P. J. WATSON.

Among the worst and most costly troubles of the amateur motorist are those connected with the piston, and if he is unable to discover the cause of the disorder he may have to pay heavily for curing that which could be avoided by observing the following simple precaution:

Recently when my engine failed to work properly I determined to look into the matter myself, and started by removing the cylinder heads. I discovered small particles of metal around the edge of the cylinders and the cylinders themselves were scratched up. Tracing this to its cause, I discovered that the feed pipe was almost clogged up with small particles of corroded copper. Going further, my gasoline tank showed signs of corrosion, which I attribute to poor gasoline, containing considerable moisture, thereby causing corrosion of the copper tank. After giving my tank a thorough washing and scraping I had it electroplated inside with a coating of tin. All particles of metal were removed from the cylinders, the feed pipe was cleaned out, and the parts were connected up. I have been running my motor for the past eight months without the trouble recurring, and have saved myself the cost of a new tank.

HOW TO DRILL A HOLE CENTRAL IN A BAR.

It is a rather difficult matter to drill a hole in a bar and keep the hole central. The accompanying drawing shows a practical kink. A piece of tool steel



METHOD OF DRILLING A HOLE CENTRAL IN A BAR.

A is caught in the lathe chuck, and is turned and bored so the hole will run true with the outside diameter. The outside diameter is turned the exact size of bar *B*, which is to be drilled. The bar *B* is placed in a vise as shown, the drill jig *A* is placed on top of the job, and the vise is then tightened up. As the jig and the bar are of the same diameter, the vise will hold them both very rigidly while the bar is being bored.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

BRAIDED NECKTIE.—O. HOLZHEY and O. DICKHAUS, New York, N. Y. This tie is so braided that the neck-band portion will be substantially inelastic and of a close weave, permitting it to slide easily between the folds of a turn-down collar. The tying ends are formed integral with the neck-band and are of greater width and looser weave than the neck-band portion and the terminal portion of each tying end is of tubular form and turned back, so that the free edges are concealed within the bulb. There are the same number of threads the entire length, and means provide for ornamental design.

Electrical Devices.

BRACKET FOR TELEPHONE-RECEIVERS.—H. P. VOSS, New York, N. Y. The object of the inventor is to provide an attachment for a telephone of the class which refers more particularly to desk telephones, which will enable the receiver to be adjusted to the ear so that it will be supported in the proper position, while leaving both of the hands free to write or to make memoranda of the conversation.

DENTAL FORCEPS.—E. C. LOMBARD, New York, N. Y. The forceps are of that type commonly employed for the extraction of teeth, and the object of the invention is to so construct the forceps that a current of electricity may pass from one jaw of the forceps through the tooth or the gum to the other jaw of the forceps while the forceps are in use.

Of General Interest.

FENCE-POST AND ANCHORAGE-BASE.—P. T. BAILEY, Newport, R. I. An object of this improvement is to provide a base which may be made of thin cast metal, or constructed from compressed sheet metal, the purpose being to provide a strong, light construction which may be cheaply manufactured. The various forms of blades and spikes, together with the post, may be formed of thin castings of rolled sheet metal, which can be pressed into the desired shape.

MUSICAL INSTRUMENT.—W. H. DESSUREAU, Hazelhurst, Wis. The invention refers to gramophones. Means provide for connecting the stylus with the bridge of the violin, and for supporting a violin on the casing of the gramophone. A stylus or needle is attached to a violin or a like instrument, and the latter is held suspended, with the stylus in contact with a revolving record, so that the violin forms the sound reproducer and amplifier.

CONCRETE WALL CONSTRUCTION.—L. LAPERSONNERIE, New York, N. Y. The aim in this case is to provide a concrete wall construction, arranged to provide suitable furring strips for fastening door frames, base boards, picture moldings and the like securely in place on the wall, the said strips forming integral parts of the blocks of concrete or other plastic material.

SAFETY GUARD OR SUPPORT.—L. B. MELIUS, New York, N. Y. The invention pertains to guards for watches and the like, and the object is to provide a guard or support which is simple and durable in construction, exceedingly strong, and arranged to hold an article such as a watch, garment or the like securely in position and against accidental detachment or forcible removal by unauthorized persons.

TOOTH-CROWN.—P. SCHAEFER, Oakland, Cal. This invention relates to certain improvements in tooth crowns, and more particularly to certain improvements in the manufacture of the pattern or model in imitation of which the gold crown is cast. The tooth crown conforms perfectly to the tooth, as an annular band for fitting around the tooth, presents the desired contour and is all formed of a single casting.

Hardware and Tools.

BANK-NOTE CUTTER.—H. E. HOKE, Hanover, Pa. The purpose of this inventor is to provide a cutter with a plurality of blades, which will hold a sheet of notes in position to be cut when the handle is operated, the frame of the cutter being open so that the notes fall therethrough when cutting.

CIRCULAR-GLASS CUTTER.—W. CHASE, JR., Indianapolis, Ind. Among the principal objects which this invention has in view are the provision of an implement which may be centrally located upon the surface of glass and there immovably held, and to provide a swinging arm pivotally mounted upon a fixed structure and hingedly secured thereto.

STAPLE.—H. F. MERRILL, Williston, N. D. Among the principal objects of this improvement are to provide a device having two anchoring extensions adapted to be driven into wood to form the grooves extended laterally from the path of the insertion of the device, and to produce a fastening device which is economical in structure, and durable and efficient in operation.

WINDOW-BLIND HOLDER.—O. THOMASEN, New York, N. Y. This invention relates to mechanism for use in holding blinds and analogous structures, the more particular purpose being to enable the operator to secure the blind rigidly in an infinite number of definite positions, so that the screening effect of the blind may be more readily controllable at will.

Heating and Lighting.

VAPOR-BURNER.—A. H. WAITE, El Paso, Ill. This invention is an improvement in vapor burners of the character disclosed in Letters Patent formerly granted to Mr. Waite. The principal features are pipes which curve about at opposite sides of the perforated top of the evaporating burner and directly above the screen of this burner, each pipe having an open forward end turned downwardly at the front of the stove. These at their opposite ends are connected to a common pipe, which passes through an air duct, and discharges at the vaporizer.

HYDROCARBON-BURNER.—B. L. WORTHEN, Tueson, Ariz. The improvement is adapted to various purposes of the arts, and one of the principal objects thereof is to provide a hydrocarbon burner in which crude oil, associated or combined with air, steam or other aeriform fluid, is most economically and effectively utilized in the production of a flame developing the maximum of units of heat and of force possessing the maximum of intensity.

MOP-WRINGER.—S. T. ATKIN, Georgetown, Texas. This invention is an improvement in mop wringing devices for use on buckets or pails. The mop wringing attachment is designed for use with that class of mops wherein the ends of the mops are held in the holder and the mop is formed into a looped form which may be fitted over the wringing arm and then twisted to wring out the water. The wringing arm is located within the bucket, reducing the liability of overturning the bucket during the operation of wringing the mop.

Machines and Mechanical Devices.

DEVICE FOR AUTOMATICALLY DELIVERING ARTICLES.—N. R. STILES, 34 Leadenhall Street, London E. C., England. This invention relates to devices for delivering articles automatically from a container and is specially applicable for the delivery of cigarettes and the like from a cigarette container. Devices of this character as hitherto proposed have been unreliable in practice usually on account of the faulty feeding means to the element which selects the articles to be presented.

BRICK-MOLDING MACHINE.—T. YOUNG, Lakeland, Fla. The object of the inventor is to provide a machine in which the bricks may be molded, in which the bricks are readily accessible, and which will separate from the bricks with the least danger of breaking and crumbling. It relates to brick molding machines in which the material is forced into the mold by tamping, the bricks being then removed to be dried and baked.

ROTARY FAN OR PROPELLER.—H. RUTHENBERG, 52 Königs Allee, Villen Colonie Grunewald, Berlin, Germany. The invention relates to improvements in rotary fans or propellers adapted to act upon the air, and particularly to such air propellers as are used for propelling air ships or flying machines, and which are actuated either by hand or mechanical means.

Prime Movers and Their Accessories.

GAS-ENGINE-VALVE TIMER.—T. P. HUDEN, North Bend, Ore. In operation the engine which is preferably provided with a compressed air starting device, and with the usual sparking device, is started by the said compressed air device. To reverse the engine, it is necessary to move the lever to the neutral position, before it can be reversed. Means provide for operating the valve to open the exhaust at every revolution of the crank, this being necessary for the proper working of the engine when starting.

Railways and Their Accessories.

STATION-INDICATOR.—C. MESSING, New York, N. Y. This invention pertains to a new and improved device to be used in street cars, railroad cars, subway trains and the like, to indicate the various stations, stopping places or streets. An object is to provide a station indicator which may be used on any number of branch lines with means for changing from one branch to another, such means including prevention of overrunning the changing point.

Pertaining to Recreation.

GAME APPARATUS.—W. A. SULLIVAN, New York, N. Y. This invention relates to a game apparatus, and has for its object to provide an apparatus having a member supporting a ball, which is adapted to be moved lateriy by a baseball bat in the hands of a player, there being means which is adapted to indicate the force of the blow as the bat is brought suddenly into contact with the ball.

Pertaining to Vehicles.

TIRE-CASE.—C. A. RUSSELL, New York, N. Y. This improvement pertains to tire cases or covers such as used for enveloping automobile tires, or the tires of similar vehicles so that they will be protected from the weather. Such covers are used especially on extra or spare tires which are carried usually in an exposed position somewhere about the body of the vehicle.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Legal Notices

PATENTS

INVENTORS are invited to communicate with **Munn & Co., 361 Broadway, New York,** or **625 F Street, Washington, D. C.,** in regard to securing valid patent protection for their **inventions. Trade-Marks** and **Copyrights** registered. **Design Patents** and **Foreign Patents** secured.

A Free Opinion as to the probable patentability of an invention will be readily given to any inventor furnishing us with a model or sketch and a brief description of the device in question. All communications are strictly confidential. Our **Hand-Book** on Patents will be sent free on request.

Ours is the **Oldest** agency for securing patents; it was established over sixty-five years ago.

MUNN & CO., 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

PATENTS PRODUCE FORTUNES

PRIZES for patents. Patents secured through us advertised without charge. New lists of inventions needed and possible buyers. "Hints to inventors." "Why some inventors fail." Book on patents. Send us rough sketch or model for search of Patent Office records and report on patentability. Special agents in 500 cities and towns. Mr. Greeley while Acting Commissioner of Patents had full charge of U. S. Patent Office. **GREELEY & McINTIRE, Patent Attorneys, Washington, D. C.**

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending May 31, 1910,

AND EACH BEARING THAT DATE

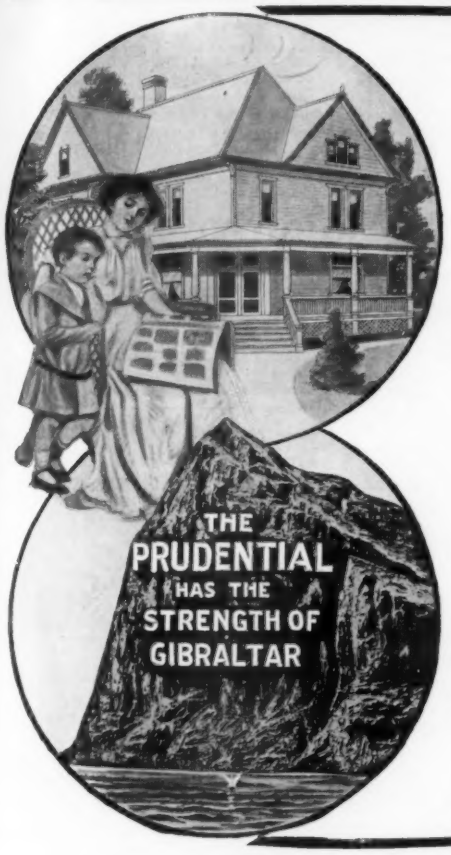
[See note at end of list about copies of these patents.]

Acetylene generator, C. F. Spaulding..... 960,051
Air, gas, or other gaseous fluids, compressing, E. F. Osborne 960,233
Alarm. See Fire alarm.
Aniline black on fibers and fabrics, production of, A. G. Green..... 959,516
Animal trap, D. H. Harman..... 960,170
Arm and lever, S. E. Davis..... 959,475
Ash pan, T. R. Higdon..... 960,174
Automatic elevator, mechanically controlled, A. Sundh 959,645
Automobile engine hood, Winton & Anderson 960,152
Automobile license tag holder, E. E. Hancock 959,735
Automobile steering mechanism, C. B. Watties 959,978
Bagging machine, A. M. Bates..... 959,447
Bailing mechanism, C. J. Foglemark, Sr.... 960,221
Band cutter and feeder, J. B. Bartholomew 959,445, 959,446
Bandage, S. Bottomley 959,704
Barrel filling machine, H. W. Colby..... 959,463
Barrette, double tongue, A. Burke..... 959,712
Bath cabinet, J. C. Hoyt..... 959,743
Batteries and manufacture thereof, negative plate for storage, P. G. Salmon.. 960,115
Battery cell, electric, M. E. Fuld..... 960,222
Bearing, O. G. Cosby..... 959,469
Bearing for conveying rollers, ball, S. L. Goldman 960,009
Bearing, ball, H. Hess..... 959,529
Bed spring appliance, M. E. Wilder 959,670
Bedclothes holder, W. J. Lehr..... 959,763
Bell ringing mechanism, G. Boyd..... 960,007
Bellows, reversible, L. H. Maier..... 959,771
Belt fastening device, G. W. Southwi 960,121
Belt stretcher, D. Rudy, Jr..... 960,201
Belt tightener, L. White 959,667
Bench dog, W. J. Stiver..... 960,053
Binding post, G. W. Goodridge..... 960,087
Binder, temporary, C. B. Buck..... 960,240
Binocular prism, J. Heckel..... 959,739
Blackener, shoe, S. G. H. Glasgow..... 959,507
Blacking stand and bootjack, combination shoe, A. Bancroft 960,148
Blade folder, O. A. Clark..... 959,905
Blank feed mechanism, A. C. Campbell.... 959,918
Blind or awning, S. Mrokowski..... 960,230
Block. See Building block.
Boiler attachment, Morris & Watkins..... 960,229
Boiler header, W. F. Sellers..... 960,044
Book, conductor's report, S. E. Creasey..... 959,470
Book device, loose leaf, C. Forgerson..... 959,849
Book holder, manifolding sales, C. A. Monson 960,030
Book, manifolding, B. C. Maxwell..839,775, 959,776
Book, sample card, J. A. Soderstrom..... 959,632
Boot lace and necktie clip or fastener, C. J. F. Highfield..... 960,013
Bootjack and foot rest, combined, H. Seckendorff 960,042
Boring machine, angle, Keithley & Schien. 960,097
Boring machine, portable, L. Dailey..... 960,002
Bottle filling machine, C. F. McEwan..... 959,577
Bottle, non-refillable, L. M. Packard..... 959,702
Bottle, non-refillable, A. W. Patrick..... 959,794
Bottle, poison, S. H. Kellogg..... 959,751
Box, C. W. Cohn..... 959,922
Box, G. J. Eichhorn 960,220
Bracelet, belt, etc., J. J. Sommer..... 960,050
Bracelet fastening, A. Emrich..... 960,079
Braiding machine, Steinmann & Pfrunder.. 960,122
Brake apparatus, electromagnetic, A. Sundh 960,055
Brake beams, forged steel fulcrum for trussed type of, P. T. Handiges..... 959,524
Brake head, adjustable, F. R. Cornwall... 959,466
Brake head, adjustable, Porter & Williams 959,690
Brake head and shoe, Hysell & Cavedo.... 959,542
Brooder, A. Waldwick..... 959,975
Brooder, fireless, G. H. Lee..... 960,099
Broom cover, Cummings & Lynch..... 960,158
Broom head, L. R. Reeder..... 960,198
Brush, J. F. Moore..... 959,574
Brush, jeweler's polishing, W. Dixon..... 960,216
Bucket, J. S. Barron..... 959,695
Buckle frames, machine for forming, C. S. Huntington 959,941
Buckle, trace, E. C. Kimball..... 959,868
Buffing machine, J. F. Gail..... 959,502
Building block, A. D'Elia 959,846
Building block, W. R. Dodds..... 960,217
Bundle tying device, J. Gregory..... 960,089
Burner. See Gas burner.
Burnishing machine, C. Pease..... 959,880
Burnt wood articles, apparatus for producing, F. G. McAlpin..... 959,783
Butter treating apparatus, C. Glass..... 959,508
Buttonhole guide, M. L. Stanton..... 959,639
Cabinet, credit, H. N. Vick..... 959,821
Cabinet, sanitary cold air food, C. A. Buel, Jr. 959,709
Cabinets or the like, margin piece for, D. E. Hunter 959,939
Cables, branch block for suspended, J. S. Stewart 959,969
Cake beater, G. B. Smith..... 959,811
Calendar, perpetual, E. W. Doolittle..... 959,479
Calipers and poising tool, combination, E. Benson 959,699
Calipers, micrometer, Z. R. Tucker..... 959,974
Call distributing switch, P. V. Christensen 959,462
Calorimeter bombs, charging device for, C. J. Emerson 959,488
Can end, D. P. Robinson..... 960,105
Can opener, J. M. Allen..... 960,000
Canning apparatus, J. S. Hildebrand..... 959,861
Candy casting machine, J. Werner..... 959,985
Candy molding machine, J. Werner..... 959,984
Caoutchouc-like elastic substance, producing a, M. Schluss 960,116
Car coupling, H. J. Daubert..... 960,077
Car door operating mechanism, dump, W. A. Caswell 959,459
Car fender, A. J. Thornley..... 960,056
Car steps and doors, mechanism for operating, J. F. McElroy..... 959,873
Car tank, V. M. Summa..... 959,817
Carbureter, Fay & Ellsworth..... 960,080
Card cutting machine, Jacquard, J. Schull. 960,118
Card punching machine, Jacquard, J. Schull 960,117
Cards, playing, W. Shakespeare, Jr..... 960,205
Carriage top rest, R. L. Notman...959,790, 959,791
Carrier, L. F. Haddon..... 959,733
Cartridge bandoleer, gun rest, shoulder strap, and recoil pad, combined, R. C. West 960,058
Casement fastener, G. L. Fisher..... 959,494
Cash register, A. G. Carlson..... 959,840
Casing elevator, F. S. Barkelew..... 960,239
Castings, machine for making, A. Kribs.. 959,557
Centering machine, W. B. Johnson..... 959,865
Centrifugal separator float, C. H. Shaw.... 959,625
Chain drive, H. K. Holsman..... 959,552
Chair, A. Searles 959,619
Chairs, actuating foot rest for rocking, F. W. C. Leipert 959,949
Check assorter, C. H. Jones..... 959,943
Cherry pitter, C. W. Bridgeman..... 959,450
Chimneys, water guard for, W. F. Greenlee 960,088
Chuck, P. J. Grebel..... 959,515
Churn, N. B. Osler..... 959,877
Cigarette former, H. E. Robinson..... 960,110
Circuit breaker, Wohl & Hertzberg..... 959,827
Circuit breaker, E. H. Smythe 960,049
Circuit controlling apparatus, L. C. Nicholson 959,787, 959,788
Clamp. See Saw clamp.
Cleaning, apparatus for chemical, H. Resch 959,883
Clinometer for well bores, A. F. L. Bell.... 959,912
Clock, electric, B. Jaegermann..... 959,864
Clock, electrically operated, T. Mungall.... 960,186
Clothes drier, G. Schneider 959,885
Clutch, magnetic, Martin & Shepherd..... 959,509
Coal washing apparatus, Dandridge & Cessna 959,473
Coaster brake, C. Glover..... 959,509
Cock for boilers, draw off, W. L. Belknap. 959,698
Coil bending machinery, Burns & Swoger.. 959,455
Coin controlled lock, S. J. Kelly..... 959,753
Collar, horse, G. W. Todd..... 959,652
Color, medium for oil, W. B. Allen..... 960,141
Colter, W. Stacy 959,637
Comb, E. E. Keefe.....959,800, 959,807
Compiling machine, W. T. Sullivan..... 959,644
Composition of matter, W. J. Thorold..... 959,650
Compressing machine, T. Lund..... 959,869
Compressing machine, W. M. Gentle..... 959,928
Concrete block and wall construction, J. J. Sleeper 959,629
Concrete construction, structural metal shape for reinforced, P. Straglotti..... 960,054
Concrete mixing machine, Goodmundson & Smith 959,512
Concrete, steel bar for reinforcement of slabs, beams, or similar constructions of, F. Selmer 959,808
Condenser, A. Steinbart 959,640
Connection, flexible, F. W. Basden..... 960,061
Conveyer roller, S. L. Goldman..... 960,010
Cooking corn and other food products, apparatus for, H. C. Baxter..... 959,448
Cooking, etc., electrically heated apparatus suitable for, A. F. Berry..... 959,913
Cooking vessel, W. Sylvester..... 959,647
Cooking vessel, C. F. Molander..... 960,105
Corn husking machines, etc., roll for, A. F. Wolfe 959,904
Corner joint, D. E. Hunter..... 959,940
Cotton chopping machine, J. M. Martin..... 959,774
Cotton cleaning machine, G. A. Humason.. 959,740
Cotton picking machine, F. Prestwich..... 959,603
Couch and bed, combined, B. C. Poston..... 960,195
Couch, suspension, J. B. Patterson..... 959,795
Crane controller, T. E. Barnum 959,909
Crane, pontoon, G. H. Huiett 960,224
Cranes, counterweight for pontoon, G. H. Huiett 960,225
Crate, folding egg, C. T. Sibold 959,627
Crate and show bench, W. O. Roy..... 960,199
Crusher, Niedermeyer & Bernhard...960,231, 960,232
Cultivator, P. T. Zollers 959,683
Cultivator shovel, W. J. Herscher 959,528
Culvert, F. B. Zieg 960,137
Cup. See oil cup.
Curtain hoisting apparatus, A. M. Coyle.... 959,993
Curtain ring and hook, A. M. Clerk 959,921
Curtain stretcher, J. S. Heeley 960,012
Cushion wheel, R. E. Cole 960,154
Decorticating the fibrous leaves or stems of plants, machine for, E. Wright 960,134
Dental bracket tray, sanitary, G. Holtz 959,534
Dental chair, F. Ritter 959,698
Dental, medical, or surgical purposes, switch-board for, D. Stern 959,641
Dental mouth prop, W. Adelman 959,684
Dentist's cotton holder and waste receptacle, B. G. Simmons 960,236
Desks, ink bottle holder for, V. D. Maney.. 959,772
Dish washer, M. W. Larson 959,562
Dispensing mobile substances, apparatus for, C. Christensen 959,717
Display box, C. M. Blackman 959,701
Distributing system, automatic, L. D. Kellogg 960,176
Door fastening device, L. A. Day 959,476
Door, flush hinge, J. G. Schmidt 960,203
Door lock, entrance, A. Arens 959,834
Door, metal, S. F. Myers 959,782
Door opening device, T. J. C. Schirrmacher. 959,615
Door operator, P. T. Handiges 960,523
Door, turning, A. Goubeaut 959,514
Dough and like plastic substances, machine for mixing and kneading, J. E. & C. E. Pointon 959,863
Draft equalizer, J. Van Matre 960,126
Draping machine, S. S. Sencenbaugh 959,809
Drying machine, G. A. Cutter 959,722
Drying machine motor, centrifugal, J. W. & W. A. Macfarlane 959,507
Drill brace, C. Warmholts 959,824
Drinking vessels, sanitary cleansing and indicating device for, C. W. Thornton .. 959,970
Dropper, T. A. De Vilbiss 959,847
Dropping mechanism, differential, F. F. Murphey 960,187
Dust collector, H. Hill 959,936
Dust pan, Feld & Froehlich 959,926
Dye and making same, green vat, H. Kraft 960,098
Dye and making, vat, Schmidt & Bryk..... 959,617
Dye, gray anthraquinone, W. Mieg 960,182
Dynamo machine, D. C. Jackson 960,093
Educational apparatus, L. Barritt 959,987
Egg beater, Horner & Patterson 959,536
Egg beater, J. N. Ramstad 959,606
Egg beater and cream whipper, H. K. Gilmour 959,731
Electric apparatus, Jackson & Schelbe 959,544
Electric generator, J. L. Milton 959,954
Electric heater,, J. F. McElroy 959,872
Electric machine, dynamo, E. M. Tingley.. 959,651
Electric machine, dynamo, Underwood & Smith 960,001
Electric machine, dynamo, J. E. Noeggerath 959,959
Electric machine ventilating means, dynamo, A. Kingsbury 959,550
Electric machines, brush holder for dynamo, C. E. Johnson 960,095
Electric switch, W. D. R. MacDiarmid 959,709
Electrical connector, Washburn & Lawrence 959,977
Electrical machine brush or collector, S. Sparrow 959,634
Electrical switchboard, J. A. Schaefer 959,886
Electrode support and conductor, I. R. Edmands 959,486
Electrolytic and similar solutions, treating, G. A. Gabriel 959,730

Electrolytic apparatus with liquid anode, K. Hahn 959,521
Elevator. See automatic elevator.
Elevator apparatus, P. H. Melander 959,778
Elevators, combined operating and controlling means for hydraulic, S. G. Neal 959,786
Embroidery attachment, R. W. Shockley 959,889
Engine starter, explosive, G. Burson 960,072
Engine starter, hydrocarbon, O. Brisbois 959,980
Engine starting device, Colhower & Sainsbury 959,997
Engines, operating explosive, P. L'Orange 959,951
Excavating machine, G. W. King et al 959,756
Explosion or combustion motor or pump, C. A. & O. W. Hult 959,748
Explosive engine, J. F. Woolf 959,905
Eyeglass mounting, E. J. Strohm 959,816
Eyeglasses, E. J. Strohm 959,815
Fan, J. H. Gulland 959,503
Fastener, C. Joseph 959,545
Fastening inserting machine, W. O. Wheeler 959,666
Feed water heater, Sweeny & Grindle 960,209
Fence attachment, J. R. Graft 960,164
Fences to stretcher jacks, means for clamping, A. & C. A. Church 959,842
Fender, E. V. Shoe 960,130
Fertilizer distributer, O. W. Siebenhaar 959,628
Filtering apparatus, C. M. Chamberlain 959,461
Filtering apparatus, E. P. Dargin 959,844
Fire alarm, automatic, J. Yates 959,828
Fire escape, A. Brown 960,068
Firearm, T. C. Johnson 959,942
Fireproof column, J. J. Tessidder 960,125
Fireproof construction, A. Priddle 960,197
Fireproof door or shutter, E. H. McCloud 959,576
Fireproof magazine for film reels, N. Power 959,691
Fish hook, A. Paysen 959,587
Fishing reel, Shakespeare & Russell 959,623
Flanging machine, automatic, J. E. Graybill 959,936
Flask. See modder's flask.
Flat iron heating apparatus, F. Schitka 959,616
Floor surfacing machine, Cummings & Hathaway 959,721
Fluid operated apparatus, E. Ketterer 959,547
Fluid regulator, automatic, J. J. McDonald 960,033
Fly paper holder, Stoner & Trout 959,808
Fly trap, F. M. Humphrey 959,747
Flying machine, motor, A. Wunderlich 960,136
Folding machine feed device, Adams & Wallace 960,138
Food products, apparatus for dehydrating, G. D. Harris 959,933
Foot guard, W. S. Newhall 960,035
Footwear stretcher, H. A. Halvorsen 959,932
Fruit mixing machine, B. F. Fish 959,726
Fruit press, T. P. Maddox 960,102
Fuel briquet, D. C. McCan 959,870
Fuel, means for feeding fluid, T. Turnbull, Jr. 960,057
Furnace, J. Weintz 959,980
Furniture, W. A. Snyder 959,631
Furniture attachment, sliding shoe, W. Dichmann 959,478
Furniture, collapsible, A. E. Holmes 960,015
Fuse block, J. Collins 960,155
Fuse for electrical circuits, Kintner & Roesblatt 959,552
Fuse, safety, Sachs & Reynolds 959,807
Fused terminal, Conway & Bisbing 959,719
Fusee, W. D. Jackson 960,094
Game, J. R. Sixon 960,190
Game apparatus, C. E. Burbank 959,710
Game apparatus, H. F. Wright 959,985
Game, cage for, A. Tomkins 959,973
Gang plank, Kelemen & Lasar 960,022
Garden implement, O. H. & W. G. Peeples 959,797
Garment hanger, J. F. Altermatt 959,687, 959,688
Garment supporter, H. C. Hine 959,937
Gas and air mixer for burners, Peterson & Lackett 959,593
Gas burner for flare lights, C. C. Wakefield 960,127
Gas burner for inverted and upright incandescent lights, incandescent, F. Kratky 959,700
Gas engine, C. Beckmann 960,063
Gas generator, acetylene, M. W. Carrier 959,994
Gas lighting apparatus, electric, D. M. Hartford et al. 959,525
Gas lighting system, regulator for, G. E. Hulse 959,745
Gas main stopper, P. Goodman 960,086
Gas mixer, C. V. Pollock 959,597
Gases, etc., separation of, Levy & Heibronner 959,593
Gearing, Sester & Oelkers 959,622
Gearing, transmission, W. F. Sword 959,900
Gill box drawing head, H. L. Offermann 960,107
Glass articles and vessels, producing wire, J. I. Arbogast 960,146
Glass, method of and machine for making wire, J. W. Hoyer 959,537
Glassware, manufacture of, H. C. Fry 959,500
Glove fastener, W. H. Harris 959,737
Gluing machine, J. F. Zapf 959,556
Governing mechanism for explosive engines, G. H. Hayes 960,173
Governor, engine, C. Grant 959,853
Governor for steam or elastic fluid engines, C. W. Dake 959,471
Grain heaters, agitator for, A. J. Koegler 960,024
Grain shocking device, hand, H. Ferris 959,492
Grass and ditch line cutter, C. Dawes 959,845
Grate, W. E. Marengo 959,589
Grate for concentrator jigs, S. P. Robinson 959,811
Gravity jig attachment, F. Richardson 959,907
Grinding and surfacing, H. B. Nichols 960,188
Grinding cocks, machine for, P. Gerstenkorn 959,506
Grinding lawn mowers, clamping device for, J. F. S. Gobie 960,163
Grinding mill, G. Carlson 959,714
Grippers, R. F. McFeely 959,874
Gumming device for envelop, bag, and like making machines, Fischer & Wescher 959,493
Gun, M. Telscheff 959,648
Gun, air, E. H. Searle 959,889
Gun cleaner, M. O. Yerkey 959,680
Gun sight adjusting means, D. C. Cleary 960,153
Hair waving apparatus, P. E. Herrmann 959,527
Hammer or the like, F. Baldwin 960,147
Hammock, bed, C. B. Eaton 960,078
Hanger board switch, H. L. Smith 959,891
Harness pads, machine for manufacturing, C. H. Gringe 959,519
Harrow, C. B. Rosar 960,200
Harvester elevator, J. Boda 959,703
Hat and coat hanger, C. H. Pelton 959,589
Hat fastener, W. J. Paton 959,586
Hat fastener, L. Brody 959,991
Hay loader, S. K. Dennis 959,477
Hay loaders, draft connection for, S. K. Dennis 959,724
Hay rake, C. Pearson 959,796
Header, grain, R. C. Towner 959,635
Heading machine feed mechanism, Campbell & Cummins 959,456
Heading machines, reverse feed for, A. C. Campbell 959,453
Headlight, C. R. Blackman 959,700
Headlight, R. Macdonald 959,770
Headlight, W. C. Huebner 960,018
Headlight, adjustable, A. S. Charlton 959,920
Heater. See electric heater.
Heating system, steam, W. L. Garland 959,504
Heel and sole protector, boot and shoe, Whitcher & C. F. Randall 959,982
Heel and sole protectors for boots and shoes, machine for setting, Winter & Conlon 959,984
Heel cushion fastening, W. L. Gordon 959,513
Heel support, J. C. Moorefield 959,956
High voltage switch, W. T. Goddard 959,929
Hinge, C. T. J. Giles 960,085
Hinge and lock for box covers, F. W. Tobey 959,971
Hinge, shutter, A. B. Landis 959,500
Hoist, horse power, A. M. Smith 959,630
Hoists, stop motion apparatus for, A. M. Coyle 959,998
Hoisting device, S. Wright 959,977
Hoisting platform, C. M. Armstrong 959,835
Horse nostril protector, T. Ancill 960,142
Hotbed drag out, R. H. Stevens 959,813
Ice machine, H. D. Pownall 959,602
Ice, making, A. E. Beals 959,697
Images on glass, porcelain, ceramic, metallic, or other surfaces, reproduction of, M. Anthes 959,692
Indicator reducing motion mechanism, F. O. Ball 959,443
Ink fountain, distributing, E. S. Ladd 959,558
Inking ribbon, G. T. Newton 960,036
Inside, spring, R. W. Morgan 959,575
Insulating material, making, W. R. Seigle 959,620
Internal combustion engine, L. T. Rasmussen 959,805
Ironing board, J. A. Lowe 960,101
Ironing board, A. D. Williams 960,213
Irrigating apparatus, C. Revil 959,914
Jar closure, G. W. Dungan 959,848
Jar filler, M. C. Carson 959,715
Key guide, F. A. Reffelt 959,908
Kiln, E. Cole 959,906
Knife cleaner, Philipp & Aeppli-Meier 959,803
Knitting machine bed, W. O. Walt 959,822
Knotter, B. A. Peterson 959,592
Labeling device, bread, J. Limmer 959,767
Lamp, J. H. Purdy 959,804
Lamp burner, vapor, H. Griswold 960,167
Lamp casing, J. Lawler 960,179
Lamp filler, Dow & Cole 959,489
Lamp locking device, incandescent, Timm & Barnhardt 959,818
Lamp socket, electric, J. G. Peterson 959,594
Lamp support, adjustable electric, J. B. Coe 960,076
Lamp switch, incandescent, J. A. Mebane 959,572
Lamp, vapor, C. Halstead 960,011
Lantern, F. D. Spear 959,635
Lap board, J. P. Rochu 960,112
Last, divided, J. D. Winchester 959,672
Leg joint, artificial, D. W. Price 959,881
Level, J. H. Kouns 959,759
Life preserver, Wilkinson & Upham 960,129
Lift, air, W. A. Knight 960,023
Lifter. See tire lifter.
Lightning arrester, H. C. Walford 959,658
Line casting machine, D. S. Kennedy 959,755
Linotype machines, automatic pump stop mechanism for, Pearce & Billington 959,967
Liquid retainer, W. B. Fisk 959,495
Lock corner, E. R. Hall 959,734
Lock washer, E. D. Heagney 959,857
Locomotives, cable reeling mechanism for electric, F. L. Sessions 959,621
Loom, R. H. Hunt 960,019
Loom for weaving pile fabric, L. H. Hartley 960,171
Loom pattern mechanism J. T. Cyr 960,214
Looms, bobbin stripper for weft replenishing, F. W. Moore, reissue 13,119
Looms, thin place detecting mechanism for, W. C. Trombly 959,654
Loom, wire motion for, F. A. Whitmore 960,211
Mail box, W. C. Padgett 959,511
Mail box, L. V. Reed 959,885
Mail box, S. C. Cox 960,157
Mail collecting device, W. M. Corthell 959,467
Mail deliverer, W. M. Corthell 959,468
Mail receiving and delivering apparatus, R. W. Lomax 960,180
Marking gage, W. Potter 960,039
Marking laundry tags, clothes, and other articles made of textile fabrics, H. Higgin 959,860
Measure, tape, L. L. Joseph 959,750
Measuring instrument, electrical, C. E. Foster 959,497
Measuring instrument, electrical, S. M. Kintner 959,551
Measuring rule for tailors, A. Tomaselli 959,972
Meat rack, sanitary, W. L. Adlam 959,685
Mechanical movement, T. Willi 959,820
Metal blank heading machine, A. C. Campbell 959,454
Metal box and crate, G. Klenk 959,553
Metal heading, punching, and trimming machines, blank feed for, A. C. Campbell 959,455
Metal, producing hollow articles of, W. Griffith 959,518
Metals from cyanid solutions, precipitation of, F. F. Kirkpatrick 959,757
Metals, reducing, R. J. McNitt 959,785
Metals, uniting, W. Griffith 959,517
Milk heating apparatus, S. Shapiro 960,045
Milk carriage attachment, C. E. Sweet 959,989
Mixing machine, F. Notz 959,584
Moistener, envelop, H. E. Packer 959,793
Moistening machine for adhesive materials, J. D. McLaurin 959,875
Mold, R. C. Ricker 959,806
Molder's flask, G. E. Linn 960,027
Molding machine, Keyhoe & Handley 960,177
Motor. See drying machine motor.
Motor controller, T. E. Barnum 959,907
Motor controlling device, T. E. Barnum 959,908
Motors, auxiliary mixer for internal combustion, R. D. Loose 959,950
Motors, method of and means for reversing, A. S. Cubitt 960,000
Motors, speed and circuit controlling apparatus for electric, J. A. Schaefer 959,887
Mower and harvester, H. L. Hopkins 959,535
Mowers, grass catching device for lawn, H. Deck 959,723
Mowing machine, J. A. Pura 959,882
Muffler, W. J. Hewitt 959,742
Nail, F. A. Nelder 959,876
Needle threader, C. L. Woolley 959,676
Net, fly, J. D. Evans 959,925
Net, landing, G. J. Koberstein 959,555
Nozzle, spraying, H. D. Binks 960,150
Nut burring and facing machine, W. Shand 959,624
Nut lock, J. B. Watson 959,962
Nut lock, J. A. Rankin 959,964
Nut lock, C. D. Russell 960,040
Nut, self locking, E. R. Hibbard 960,090
Oil bush and friction device, combined, W. F. Greene 959,520
Oil can, Burch & Taylor 959,711
Oil can, Evans & Gordon 960,008
Oil cup, Strong & Bartlett 959,643
Oil cup, J. N. Hawkins 960,172
Oil, extracting, F. B. Anderson 960,143
Oil extracting apparatus, F. B. Anderson 960,144
Ore concentrator and classifier, M. P. Boss 959,838
Ores containing copper, treating sulfid, J. McFetridge 959,578
Ores, reducing nickel hydrosilicate, A. Chaias 959,460
Overhead carrier, J. E. Eisenhuth 959,487
Packing device, Evans & Young 959,480
Pail, milk, J. D. Perry 959,590
Paint, fireproof, M. S. Watt 959,663
Panel board, Lake & Cuthbert 959,762
Paper bottle making apparatus, C. F. Jenkins 960,226
Paper cutting and trimming machine, H. S. Woodward 959,674
Paper making machinery, W. E. Sheehan 959,626
Paper rack, J. J. Buehler 959,839
Paper receptacle, waste, A. A. Low 960,028
Paper reducing and packing apparatus, waste, A. A. Low 960,026, 960,027
Pavement, composite, E. C. Wallace 959,976
Pen and pencil holder, J. Dean 960,218
Pens and pencils, safety clip for, W. O. Hunter 960,092
Pencil, magazine, J. A. Hollenberger 959,531
Pencil sharpener, M. W. Walter 959,660
Pencil sharpener, F. Alexander 959,831
Percolator, D. P. Moore 959,955
Perforating machine, F. P. Rosback 959,966
Phonograph cabinet, E. A. Hall 959,522
Photographic printing device, T. A. Patton 960,192
Pianos, repetition action for grand, L. Charpiat 959,716
Picture, A. E. Kennedy 959,754
Picture apparatus, motion, D. C. Woodworth 959,675
Pin. See safety pin.
Pipe connection, Schnert & McManus 960,204
Pipe coupling, T. C. Grierson 959,854
Pipe coupling, O. E. Oleson 959,960
Pipe loading machine, C. Jordan 960,227
Pipe union, Blanchard & Crocker 959,702
Plant support, L. W. Nied 959,789
Planter, F. M. Gordon 959,852
Plastic substances, device for regulating delivery of, J. J. & T. E. Fearon 960,081
Plate making machine, M. A. Droitcour 960,006
Plow cleaner, O. Huffmon 959,538
Plow, cultivator, G. W. Pobans 960,194
Plow frame, P. T. McDonnold 959,871
Plow, gang, C. P. Miller 959,953
Pneumatic transmission system, J. J. Stoetzel 959,642
Portable elevator, G. E. Wunder 959,679
Portable heater, L. Bernstein 960,064
Portable house, D. C. Slater 960,207
Potash compounds soluble, rendering, F. B. Carpenter 959,841
Power transmission apparatus, T. G. Straker 959,814
Pressure regulator, Davis & Daley 959,474
Pressure regulator, J. R. Brown 959,708
Printing cylinder and plate, M. A. Droitcour 960,005
Printing machine, M. H. Mann 959,773
Printing plate, J. S. Duncan 959,725
Printing plate and means for securing the same, flexible, M. A. Droitcour 960,218
Printing plate, flexible, M. A. Droitcour 960,219
Printing press inking mechanism, M. A. Droitcour 960,004
Printing press sheet delivery mechanism, M. A. Droitcour 960,007
Propeller, ship's, S. Labryszewski 959,761
Pump, J. Holst 959,533
Pump, tire, W. S. Stapley 959,894
Punch, eyelet setting and embossing, P. O. Mieth 960,104
Push button switch, G. B. Thomas 960,124
Puzzle, A. H. Wheeler 959,903
Puzzle, C. Bruderlein 960,071
Rack rail, G. E. Lynch 959,595
Radiator foot rest, E. G. Briggs 959,917
Rail bond, W. R. Cleveland 959,718
Rail holder, W. H. Brown 959,451
Rail joint, W. Barnett 960,062
Rail joints, splice bar for, W. P. & S. G. Thomson 960,237
Rail, third, C. A. Bluhm 960,066
Rail tie, W. D. Williams 960,130
Rails, splice bar for, W. P. & S. G. Thomson 960,238
Railway crossing, J. S. Smith 959,893
Railway frog, J. E. Conley 960,156
Railway, rope, R. Pfaffenbach 959,595
Railway switch, R. P. Kiblinger 959,549
Railway switch, automatic, E. Howard 960,017
Railway switch mechanism, automatic self-closing, H. B. Noble 959,582
Railway system, electric, F. E. Case 959,919
Railway tie, T. L. Rorcft 959,890
Railway tie, metal, J. Wettstein 959,902
Railway trains, smoke conveying attachment for, A. May 959,777
Railway, tramway, and other vehicle, J. E. Angee 960,145
Range, combined solid fuel and gas, C. H. & C. H. Miller, Jr. 960,184
Range, kitchen, C. H. Miller 960,183
Ratchet wrench, C. R. Anderson 959,690
Receptacle, liquid, A. M. Van Ronk 959,657
Record card, D. E. Hunter 959,938
Record holder, J. Roever 959,610
Recording mechanism, W. L. Morris 960,032
Reflector, W. H. O'Beirne 960,037
Refrigerating apparatus, F. D. Koeckle 959,556
Refrigerating attachment for milk cans, S. Shapiro 960,046
Refrigerators and ice boxes, drip cup for, A. May 960,102
Registering machines, electric driving device for, C. F. Kettering 959,548
Relay, interlocking contact, W. M. McClintock 959,958
Relay switch, H. M. Schelbe 959,613
Reservoirs, apparatus for forcing liquid out of, L. Barbas 959,694
Revolving furnace for volatilizing metals from their ores, H. H. Hughes, reissue 12,118
Ribbon holt, H. S. Moyer 959,781
Ring and hook, convertible, G. Beer 959,836
Rivet calking tool, Wood & Meier 959,673
Rivet setting machine, single head multiple, A. R. Havener 959,738
Roller drill, H. R. Hughes 959,539, 959,540
Rotary engine, F. J. Sprochnle 959,812
Rotary engine, G. H. Hardy 959,856
Ruler, posting, W. Morris 960,031
Running gear, H. Higgin 959,935
Saddle, C. A. Persons 959,591
Safe, W. G. Nichols 960,189
Safety pin, Dancy & Westcott 959,472
Safety pin, three pronged, A. Frederiksen 959,499
Sandpapering machine, F. Schimmel 959,614
Sash lock, A. R. Landis 959,559
Sash lock, S. G. Wellman 959,981
Saw clamp, C. S. Stevens 960,208
Scaffold, elevating, M. Herrel 959,740
Scale, B. E. Blair 959,837
Scissors, J. W. Dowden 959,481
Scraper, road, H. Wiechelman 959,668
Scraper, welded, T. H. Stagg 960,052
Screen. See window screen.
Screen plate fastening means, Webb & Barnard 959,979
Screening mechanism, W. W. Willson 959,671
Screw cutting stock and die, F. L. Harker 959,736
Screw machine, G. T. Warwick 959,825
Screw mechanism, feed, L. C. Bayles 959,911
Screws, adjusting means for feed, Shampon & Donahue 959,810
Separating bowl, device for assembling parts of a centrifugal, E. R. Bailey 959,693
Separating process, electrostatic, W. G. Swart 959,646
Sewing machine, W. F. Lautenschlager 959,948
Shade and roller, window, Lowe & De Young 960,228
Shaft collars and the like, safety connection for, J. H. Kelly 959,752
Sharpener, razor blade, G. G. Floyd 959,496
Shears, gage attachment for, Cole & Wright 959,464
Sheet metal box, G. Klenk 959,554
Sheet metal cutting machine, H. Hill 960,014
Shipping case, E. Walch 959,823
Ships' hulls and the like, cleaner for, W. R. Macdonald 959,566
Shirt, B. Rosen 959,611
Shirt, swimming, W. T. Anderson 959,441
Shoe cleaner, G. Narance 959,580
Shoes, making, A. H. Prenzel 960,234
Sign, J. Staren 959,895
Sign, portable, J. Staren 959,896
Silk like effects, compound for producing, L. Lilienfeld 960,100
Siphon, A. C. Mills 959,779
Skiving machine cutter guard, Alden & Reinhardt 959,830
Slag, handling, D. T. Croxton 959,720
Smelting, E. Dedolph 959,924
Smelting ores, A. S. Dwight 959,484
Smoke bell support, D. F. McCarthy 960,106
Smoke house, V. Molitor 959,780
Smoking pipe, etc., J. L. Thomson 959,649
Snap hook, G. M. Hubbard 959,744
Snap hook, W. A. Schleicher 960,041
Soaps, Making hydrocarbon, I. Vanden Broek 959,820
Soldering iron, self heating, H. Koenig 959,947
Sole attachment, shoe, T. J. Aldridge 959,442
Sole, slipper, Bickford & Sweet 960,149
Soles, manufacture of boot and shoe, C. E. Sanderson 960,202
Sounding apparatus, C. S. Long 959,764
Spark arrester, K. M. Colquhoun 959,923
Spark plug holder, Holden & Hendershot 960,091
Specific gravity, obtaining, A. Sommer 959,633
Speed changing mechanism, A. A. Page 959,878
Spinning and twisting frames, lappet for, J. W. Cook 959,465
Spring. See vehicle spring.
Spring trip, C. C. Plambo 959,727
Square and bevel, F. E. Powell 960,196
Stable composition containing hydrogen peroxid, M. A. Quelsser 959,605
Stacker, hay, W. S. Inbody 959,543
Stacker, hay, Armitage & Stephens 959,906
Stake holder, A. J. Bostwick 959,915, 959,916
Stamping device, check, F. G. Lundeen 959,708
Stamping, marking, or numbering machine, F. W. Merrick 960,029
Steam generator, water tube, Rosenthal & Speyer 959,612
Steam trap, G. E. Hulse 959,541
Steam trap, C. E. Squires 959,636
Steam trap attachment, R. J. Flinn 959,927
Steering gear, J. R. Walker 960,128
Steps, folding, A. F. Divok 960,003
Sterilizer, W. T. Herndon 959,858
Stills, baffle plate for column, E. Guillaume 960,223
Stitching machine guard, shoe, C. S. Carle 959,713
Stopper extractor, A. W. Stephens 959,897
Stove, base burning, W. W. Hoffman 960,175
Strainer, E. M. Newton 959,231
Straw pads, machine for making, C. M. Frazee 960,083
Studding, composition, O. M. Knode 959,946
Surgeon's operating pan, F. R. Lintleman 959,564
Suspender straps, adjustable fastening device for, J. H. Young 959,681
Swingletree hook, J. E. Wiese 959,983
Switch movement, W. Kaisling 959,944
Switch safety mechanism, F. C. Anderson 959,691
Switch starter, multiple, T. E. Barnum 959,910
Switch throwing device, automatic, C. J. G. Rickerson 959,884
Tachometer, resonance, R. Hartmann-Kempf 959,934
Tag attaching apparatus, I. Silverstein 960,206
Talking machine brake, disk, W. Zeysing 959,682
Talking machine diaphragm, F. Kane 960,021
Talking machine sound box, P. J. Packman 960,191
Telegraphy, Receiving apparatus for wireless, R. R. Goldthrop 959,510
Telephone exchange system, S. B. Fowler 959,498
Telephone support, H. Blumenthal 960,151
Telephone system, A. D. T. Libby 959,765
Telephone system, automatic, A. H. Dyson 959,485
Threshing machines, separating grate for, F. F. Landis 959,561
Ticket, railway, W. S. Parker 959,879
Tie. See rail tie.
Tire, automobile, H. S. Shafer 960,119
Tire for vehicles, elastic, I. S. McGlehan 959,579
Tire lifter, J. W. Brown 960,070
Tire protector, pneumatic, R. J. Morrison 959,957
Tire remover, P. C. Wiest 959,669
Tire, vehicle, J. W. Carhart 959,457
Tire, vehicle, J. A. Wright 960,135
Tire, vehicle wheel, W. Wiechard 960,212
Tire, wheel, B. Dahl 960,001
Tobacco pipe, A. N. Malcomb 960,181
Tool driving mechanism, H. W. Jacobs 959,803
Tool, combination, P. A. Peterson 960,193
Tool retainer for air, electric, or mechanically driven implements, M. G. Hilpert 959,530
Toy, J. T. Stafford 959,638
Toy, F. M. Callahan 960,075
Toy or picture book, G. Tuck 959,655
Track sander, W. A. Pitt 959,596
Traction mechanism, vehicle, J. L. Williams 960,059
Train signaling and brake releasing mechanism, H. H. Hunt 959,749
Transom holder, Cox & Peterson 959,843
Transplanter, A. C. Rumble 960,113
Trap rest, J. W. Walter 959,659
Tray raiser, O. B. Adams 960,139
Tread, safety, J. T. Simpson 960,148
Trigger controller, R. A. Moore 960,185
Trolley pole, C. E. Bradford 960,152
Trolley wire suspension means, S. S. Berkley 960,065
Trousers, adjustable, A. P. Melen 959,952
Trowel, J. G. Thatford 960,210
Truck, tongue, C. A. Foell 960,082
Tube cleaning tool, C. F. Overly 959,585
Tube joint, J. Kenny 959,546
Tufting machine, W. E. Buser 960,073
Tufting machines, button support for, W. E. Buser 960,074
Tug, hame, A. L. Saddlemire 960,114
Turbine, combustion, S. Z. de Ferranti 960,160
Turbines, turbo pumps, etc., manufacture of strip material suitable for the blades of, S. Z. de Ferranti 960,161
Type casting machine, O. V. Sigurdsson 960,047
Type, printing, H. J. Smith 959,968
Type setting apparatus, L. K. Johnson 960,096
Type writing machine, W. E. Barnard 959,444
Type writing machine, W. J. Barron 959,696
Type writing machine, F. A. Young 959,829
Type writing machine paper finger, C. Gabrielson 959,850
Type writing machine ribbon feeding mechanism, F. Alexander 959,833
Type writing machine ribbon reversing mechanism, automatic, G. M. Kitzmiller 959,945
Type writing machine tabulating device, F. Alexander 959,832
Umbrella, A. Peck 960,038
Umbrella, folding, Peterson & Callaway 959,902
Umbrella holder lock, Wilson & Harman 960,131
Umbrella runner, G. P. Hall 960,169
Urao, refining, Wrinkle & Paddock 959,678
Vacuum cleaner, Foster & Glidden 959,729
Valve, S. E. McKnight 959,784
Valve and the like, stop, J. Fletcher 959,738
Valve, doubly actuated expansion, G. P. Carroll 959,458
Valve, electric, F. N. Roehrich 959,609
Valve, electric, L. M. Schmidt 959,618
Valve, engine, Anderson & Hanson 959,689
Valve, engineer's, W. A. Dendry 959,798, 959,802
Valve for charge forming devices, auxiliary air, J. H. Friedenwald 960,084
Valve operating mechanism, J. T. Knott 959,758
Valve, retaining, F. H. Woods 960,133
Valve seat grinder, E. E. Townsend 959,653
Valve, triple, W. A. Pendry 959,800, 959,801
Vehicle electric driving mechanism, A. Aichele 960,140
Vehicle hood, motor, W. P. Mays 959,574
Vehicle, motor, E. Gerber 959,851
Vehicle spring, H. W. Smith 959,892
Vehicle spring, A. M. Kindwall 960,178
Vehicle suspension, road, F. Walton 959,661
Vehicle wheel, A. Brisbane ..... 959,705 to 959,707
Velocipede, E. V. Turner 959,656
Vending machine, P. S. Bloch 959,449
Vending machine, H. S. Pond 959,598
Vending machine, card, R. F. Downey 959,482
Vise, bullet clamp, H. B. Depworth 960,159
Voting machine, G. Johnson 960,020
Voting machine, J. McTammany 960,034
Wagon body, F. F. Groff 959,855
Wagon, dump, W. S. Coates 960,241
Wagon rack, adjustable, J. W. Brown 960,069
Wagon reach adjuster, W. P. Dunlap 959,483
Wagon, tank, W. & A. M. Graver 960,165
Wall tie, L. H. Selden 960,043
Warp drying machine, sized, G. Masured 959,570
Washer. See dish washer.
Washing machine, J. F. & W. P. Burkholder 959,992
Watch stem movement, G. W. Grisdale, Jr. 960,166
Water heater, T. A. Steller 960,123
Water heater, automatic, A. E. Miller 959,573
Water motor, H. T. Farnsworth 959,491
Wave receiving device, F. G. Sargent 959,967
Wedge, handle fastening, T. Hooker 959,862
Weeder, H. H. Qua 959,604
Weighing machine, automatic, H. Richardson 960,168
Wheel cutting machine, M. Pedersen 959,588
Wheel rim, vehicle, W. E. Greer 959,737
Whip label guard, N. F. Alston 959,686
Whip socket lock, G. Gabel 959,501
Willow stripping machine, G. S. & C. J. Herrick 959,741
Window, J. A. Boyd 959,980
Window screen, H. Higgin 959,859
Wire drawing machine and uncoiling appliance therefor, J. A. Horton 960,016
Wire fastener, J. Life 959,766
Wire stretcher, B. B. Bobb 959,988
Wire twisting machine, J. F. Foley 960,162
Wood bending machine, J. B. Cameron 959,903
Wood, extracting products from, F. Pope 959,590
Wood, preserving, J. Gerlache 959,505
Woodworking machine, A. B. Norris 959,583
Wrecking apparatus, Hassing & Fitzsimmons 959,526
Wrench, F. Hachmann 959,931

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., Inc., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., Inc., 361 Broadway, New York.



Guarantee a Home To Your Family

Through the Monthly Checks of

The Prudential

Monthly Income Policy

These checks, for such an amount as you may now arrange, come regularly from The Prudential every month after your death, and will guarantee your wife and children a never failing source of support.

USE COUPON

Send for full particulars and cost. For $ a month income

Name .....

Address.....

Occupation .....

My age is.....

Beneficiary's age.....Dept. 122.

The Prudential Insurance Company of America

Incorporated as a Stock Company by the State of New Jersey

JOHN F. DRYDEN, President Home Office, Newark, N. J.

A widow, age 33, living in Pennsylvania, has just received her first Prudential Monthly Income Check for $50. These Prudential checks will come every month for 20 years, or $12,000 in all. Her husband, 33 years old, took out his policy in The Prudential in February, 1910, and died April, 1910. He paid only the first year's premium to The Prudential. Think of the wonderful help this life insurance money will be to this woman. Her husband GUARANTEED a home and Monthly Income to his loved ones through THE PRUDENTIAL. Send to the Company for particulars of a Monthly Income Policy at YOUR age Use Coupon. SEND TO-DAY.

THE MUSEUM AT MONACO.

(*Concluded from page 476.*)

left contain everything relating to physical oceanography, that is, the physical investigation of the sea, comprising all kinds of instruments, such as sounding devices with samples of the sea bottom, bottles intended for taking water samples and recording the temperature at a given depth, apparatus for investigating sea currents and the density of sea water, instruments for studying the penetration of light into the depth of the ocean, laboratory installations for the physical and chemical analysis of sea water and sediments, a collection of elements contained in sea water, etc.

All these variegated exhibits have been provided with labels in the three principal languages (French, English, and German) which greatly add to their utility and enhance their international character.

The first story, which is situated at 64 meters above the sea, likewise contains a large hall, in the center of which is exhibited one of the Prince's whaleboats with the whole of its equipment. On the walls are arranged six comprehensive collections of photographs relating to the voyages of discovery organized by the Prince, and all kinds of other oceanographic subjects. To the right of the entrance door is located a switchboard for the electric lighting. The two halls adjoining the central hall are likewise taken up by glass cases containing a large variety of exhibits. The eastern hall, which is eventually to contain everything connected with the chemical and physical investigation of the ocean, and part of the sounding and fishing instruments, is taken up provisionally by divers subjects, especially those connected with marine industries, such as the sponge industry—represented by specimens of different stages of manufacture and different origins (especially Tunis)—the industry of coral (in the shape of raw materials and finished products of different origins, especially Japan) as well as the industries of mother-of-pearl, shells, pearls, salt, whalebone, whale and seal oil and skin, and finally gray amber. All the edible animals and even plants supplied by the sea are on exhibit either in a fresh condition or as preserve, and even such materials as fish oil, guano meal, etc., are represented.

Another subject of great interest, and which will have to be further developed, comprises all kinds of fishing instruments (boats, nets, etc.), either in the natural size or in the shape of diminutive models. Many scientists and the Prince himself have designed special mechanical catching outfits for deep-sea fishing, while other instruments had to be constructed for gathering the microscopical plankton of the surface, intermediary zones and sea bottom, as well as for catching ocean animals of especially large size. All these manifold utensils are indispensable for obtaining an adequate knowledge of the customs, life, and evolution of those mysterious animals, and apart from their scientific interest, are of much practical utility by enabling suitable means of protection to be ascertained in the case of organisms lending themselves for industrial utilization.

In the same hall is found a representative collection of art subjects, imitating the wonderful and most variegated forms of marine organisms. Besides the most modern productions in this connection are represented ancient Greek models with pictures of fishes, crabs, and dolphins as well as Japanese engravings, which show an admirable treatment of fishes.

The two underground or basement stories opening on the sea are admirably lighted, and apart from the aquarium hall, are not accessible to the public, being set apart for laboratory and research work. The upper basement story contains those rooms in which the collections are made ready for exhibition and study, in addition to a number of private laboratories, and a special library intended for the benefit of students in oceanography.

Every laboratory contains fresh-water and sea-water conduits, and a special experimental table designed by Dr. J. Richard, Director of the Museum, and where the animals under test can be kept alive for any length of time. Two of these private laboratories are especially equipped for researches relating to chemistry, ocean physics, physiology, etc., whereas the four remaining are set apart for zoological, botanical, histological, etc., investigations. A large photographical laboratory is installed at the eastern end of this story.

In the lower basement story is found a workshop destined for different kinds of rough work, especially the mounting of big animals, such as large fishes, whales, seals, etc. The numerous apparatus installed therein are operated by a gas motor. A special room is reserved for the dressing of fish and whale skeletons.

Two rows of aquaria are installed in the eastern wing of this underground story. An enormous iron-concrete table 21.40 meters in length, and 0.87 meter in width, parallel to the first row of aquaria (between the latter and the windows) is destined to receive a large number of transportable aquarium tanks of various sizes, the overflow from which is discharged direct on the table, the latter being so inclined that the whole of the water is collected in a central trough. These excellently lighted research aquaria will allow of a multitude of physical and biological researches in the field of oceanography. In the small aquarium basins can be investigated those smaller size animals which, being lost in the large aquaria, have to be conveniently isolated in conditions corresponding to their particular mode of life.

The sea water, derived from a rocky spot where owing to the continual whirlpool it is always fresh and well aerated, is thrown by two electric pumps to 64 meters height. From the receiving tank the water is supplied over a fall of several meters to the aquaria, allowing these tanks to be automatically aerated.

The Oceanographic Museum thus is not only an institute intended for the instruction of the general public, but a center of scientific investigation where students of oceanography will always be sure to find an equipment more comprehensive than anywhere else in the world.

The Seine at Paris runs between two stone walls in a channel that is spanned by many bridges. The width of this channel may be seen by noting that the largest and finest of these bridges—the

Wood-working Machinery

For ripping, cross-cutting, mitering, grooving, boring, scroll-sawing, edge moulding, mortising; for working wood in any manner. Send for catalogue A.
The Seneca Falls M'f'g Co.
695 Water St., Seneca Falls, N. Y.

Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE
SEBASTIAN LATHE CO., 120 Culvert St. Cincinnati, O.

He Gets GOOD MONEY Because HE IS A SKILLLED WATCHMAKER
A graduate of the oldest and most up-to-date Watchmaking School in the United States. Write for free circular B.
WALTHAM HOROLOGICAL SCHOOL
WALTHAM, MASS.

4 H.P. STATIONARY GASOLINE ENGINE $76.00
For Farmwork, Irrigation or Pumping, Factory use and Electric Lighting.
3 to 20 h. p.—perfectly governed—guaranteed by a responsible firm. Write for particulars
GRAY MOTOR CO. 121 Leib St., DETROIT, MICH

MAUPASSANT
Only $3.60; 8 Vols.
Size 4½ x 7 inches. ILLUSTRATED
226 COMPLETE STORIES and
PEARSON'S ONE YEAR
THE BEST BOOK VALUE EVER OFFERED

You may send simply $1.00, as good faith, and we will ship, EXPRESS PREPAID, with special privilege of examination, $3.60 on collect. If not satisfied, your $1.00 refunded and no questions asked. Foreign orders 50 cents extra.

FRENCH authors have written many lively tales which, because of false conventional modesty, have been, until recent translations, unknown to those who read only English. Prudish modesty and unfair prejudice have deprived us of the merriest and liveliest tales ever written. Maupassant was the one man in France who could write truly the realistic scenes of REAL PARISIAN LIFE so fascinatingly as to rivet your attention.

THE REAL DOINGS OF LIFE—is what Guy de Maupassant always gives us. His dramatic instinct, his situations and his climaxes are overwhelming. He always fixes upon the one thing of most human-soul interest and makes it as vivid as any stage scene. These absorbing stories should be in every library—tales of travel, mystery, adventure, comedy, pathos and tragedy, love and realism.

EIGHT BEAUTIFUL VOLUMES of the Most Fascinating Reading in the World. Contain over 2,500 pages, more than 800 pages to the volume, printed from new 10-point type, on pure white paper. Pages are wide, illustrated, bound in de luxe art cloth, backs and sides stamped with an ornamental design.

Advertising Edition. Write at once.
PEARSON'S MAGAZINE, 420 East 24th Street, New York City

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

BUSINESS OPPORTUNITIES.

LOCAL REPRESENTATIVE WANTED.—Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition and willingness to learn a lucrative business. No soliciting or traveling. This is an exceptional opportunity for a man in your section to get into a big paying business without capital and become independent for life. Write at once for full particulars. Address E. R. Marden, Pres., The Nat'l Co-op. Real Estate Co., Suite 378, Marden Building, Washington, D. C.

Inquiry No. 8918.—For manufacturers of "Wydt's Electro Catalytic Sparking Plug."

FINANCIAL BACKING, wanted by an inventor. Great opportunity for manufacturers. Very fascinating article, first of its kind. Partners for foreign patents wanted. Address H. Schlemmer, Effingham, Ills.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power meters.

100 PER CENT. profit selling the Lindsay soft inverted mantles; fit any inverted gasoline light. Steady customers in every town. Fine side line for salesmen. Vest pocket samples and prices on request. Lindsay Light Co., Dept. B, Chicago.

Inquiry No. 9014.—For manufacturers of machinery, supplies etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

FOR SALE.

FOR SALE.—Interest or control in manufacturing business. Exceptional opportunity for manager or instrument maker. Control, Box 773, N. Y.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

FOR SALE.—Patent No. 692,381. An improvement in electric railway of the underground trolley type. For further information address 4264 Shenandoah Avenue, St. Louis, Mo.

Inquiry No. 9038.—Wanted, the address of the Chipman Electric Purifying Co.

PATENTS FOR SALE.

PATENT FOR SALE.—No. 942,092. Sleigh attachment for automobiles. P. M. Knutson, Clifford, N. Dakota.

Inquiry No. 9060.—Wanted to buy machinery to manufacture seed corn racks.

WANTED.

SAFETY RAZOR. I wish to buy a good design or would consider purchasing patent. L. F., 700 Jamaica Avenue, Brooklyn, N. Y.

Inquiry No. 9075.—Wanted, to buy small weather vanes, such as can be used as ornaments on lightning rod tops. Aluminum preferred.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

SALE AND EXCHANGE.

FOR SALE.—Engine lathe. Our regular $75.00 lathe complete, with a face plate, two centers, wrenches and a full set of change gears to cut all size threads. Price only $45.00. L. F. Grammes & Sons, Allentown, Pa.

Inquiry No. 9027.—Wanted, the address of manufacturers of sewer pipe, made of fiber and asphaltum, suitable for laboratory use.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularising, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9080.—Wanted the address of parties manufacturing paste-making machinery.

MISCELLANEOUS.

WE are about to complete a large contract for Taximeters and are therefore in a position to take up experimental work, manufacture of fine instruments, parts for the same, dies, jigs, etc. Precision Tool & Instrument Co., 9-15 Canal Place, New York City.

Inquiry No. 9083.—Wanted, the address of firms manufacturing small beer brewing plants, from 75 to 100 gallons a day.

Inquiry No. 9094.—Wanted address of The Thomas Arithometer Company, also Burkhart Arithometer Company.

Inquiry No. 9096.—Wanted, the address of manufacturers of spiral welded pipes, possessing great strength.

Inquiry No. 9097.—Wanted, address of makers of impulse water wheels.

Inquiry No. 9099.—Wanted, address of manufacturers of machinery for making wire cables.

Inquiry No. 9101.—Wanted, addresses of manufacturers of a dip or magnetic needle, for exploring for iron ore.

Inquiry No. 9107.—Wanted, addresses of manufacturers of small emery files (pieces of emery in the shape of a file).

Inquiry No. 9109.—Wanted addresses of the manufacturers of the Dion Desk Clock.

Inquiry No. 9113.—Wanted name and address of the manufacturers of the Russell Patent Automatic Ink Well.

Inquiry No. 9115.—Wanted a machine for making pen nibs, similar to Wm. Mitchell's G. & J. nibs and Waverly nibs.

Inquiry No. 9117.—Wanted names and addresses of the manufacturers of pedometers.

Inquiry No. 9118.—Wanted, a muffler for a gasoline engine, built upon the principle of the Maxim silencer, recently brought out for use on rifles.

Inquiry No. 9119.—Wanted, name and address of the manufacturer of Zeglin bullet-proof cloth.

Inquiry No. 9120.—Wanted, the address of the Ideal Fuel Feeder Co.

Inquiry No. 9121.—Wanted, manufacturers of cut stencils for fancy work, sofa pillows, etc., and oil colors and brushes for same.

Inquiry No. 9124.—Wanted, name and address of a company in Germany making a machine to manufacture a cement and asbestos shingle and building lumber.

Inquiry No. 9127.—Wanted, address of L. Dermigny, manufacturer of a family ice machine for $10.00.

Inquiry No. 9132.—Wanted, manufacturers of a gasoline traction engine with a hoisting attachment; in other words, the machine will be used as a portable stump puller to pull sassafras roots, used in making oil of sassafras.

Inquiry No. 9134.—Wanted, a small hydraulic motor, capable of giving about one horse power with a water power of 35 lbs. per square inch.

Inquiry No. 9135.—Wanted, name and address of manufacturers of the Parshall Compressed Air Ice Machine.

Inquiry No. 9136.—Wanted, the name and address of a skunk raising farm.

Inquiry No. 9137.—Wanted, a device that will braid leather strips for horse whips.

Inquiry No. 9138.—Wanted, the address of manufacturers of machines capable of forming a number (12 or more) of pieces of paste about 36 mm. x 32 mm. x 6 mm., made of lead oxide and sulphuric acid, and placing them into a frame having a separate compartment for each piece, the space between each piece and the next being all round 4 mm. The process could be somewhat similar to biscuit making.

Inquiry No. 9139.—Wanted, the name and address of some manufacturer of a coffee mill run by water motor.

Inquiry No. 9140.—Wanted, manufacturers of disc records for gramaphones that use a sapphire point instead of a steel needle.

Inquiry No. 9143.—Wanted, name and address of the manufacturers of an air mattress.

Inquiry No. 9144.—Wanted, manufacturers of machinery for making soda water tubes, commonly known as straws.

Inquiry No. 9145.—Wanted, to buy machinery to load blasting caps or detonators.

Inquiry No. 9149.—Wanted, manufacturers of machinery for roasting coffee for small and large industries.

Inquiry No. 9150.—Wanted, manufacturers of machinery for the manufacture of French heels for ladies' shoes.

Inquiry No. 9152.—Wanted, the address of the Graham Safety Lamp Filler and Ventilator.

Inquiry No. 9153.—Wanted, name and address of manufacturers of a knotless clothes line.

Inquiry No. 9154.—Wanted, name and manufacturers of a newspaper vending machine.

Inquiry No. 9155.—Wanted, the address of manufacturers of an electric milking machine.

Inquiry No. 9157.—Wanted, manufacturers of peanut shelling and cleaning machinery.

Inquiry No. 9161.—Wanted, a machine that will grind oranges, pulp and skin into a smooth liquid or cream.

Inquiry No. 9162.—Wanted, addresses of shirt makers in Manhattan, who will make a few shirts of special design.

Inquiry No. 9163.—Wanted, manufacturers of a cradle worked by clock work.

Inquiry No. 9164.—Wanted, manufacturers of a vacuum pump that will exhaust from 3.0 to 400 c. b. inches of air per stroke and built as light as possible.

Inquiry No. 9165.—Wanted, names and addresses of parties having deposits of colored silica sand, or colored rock that is being crushed into sand.

What is the Fourth Dimension

Do you know? It is fully and clearly described in

THE FOURTH DIMENSION

SIMPLY EXPLAINED

WITH AN INTRODUCTION BY

HENRY P. MANNING

Professor of Mathematics, Brown University

Price, $1.50 net. ***260 pages illustrated***

A FRIEND of the Scientific American's donated a prize of $500.00 for the best simply-worded non-mathematical explanation of the Fourth Dimension. The prize was won by Lieut.-Col. G. D. Fitch, U. S. A. This essay, together with three others which were accorded honorable mention, was published in the columns of the Scientific American. As a result, so much interest was aroused in the subject of the Fourth Dimension that it seemed advisable to collect, in permanent form, the more meritorious of the 245 essays which were sent in from all parts of the world.

The present work presents twenty points of view, all of them interesting and no two quite alike. Each essay is 2500 words in length. The reading of one essay does not involve the reading of the entire work, yet the entire book gives a comprehensive view of what the layman wishes to know about the Fourth Dimension. No abstract mathematics will be found in the volume. The essayists endeavor to explain the Fourth Dimension both by imagining the effect of transporting an ordinary third-dimensional human being into fourth-dimensional space and also by explaining a third-dimensional man's possibilities in one and two dimensional space.

Professor Manning, the leading American authority on the subject of the Fourth Dimension, contributes an introduction in which he explains how the concept of the Fourth Dimension gained mathematical prominence, and swiftly reviews the work that has been done in the field. He has also edited the essays and supplied explanatory footnotes where required.

ORDER FROM YOUR BOOKDEALER OR FROM

MUNN & COMPANY, Inc., 361 Broadway, NEW YORK

Pont Alexandre Trois—is but 352 feet long. The constriction of the flood water within this relatively narrow channel was impossible, so it overflowed a large area along the banks of the Seine.

DR. ROBERT KOCH.

(*Concluded from page 483.*)

trypanosomes which are the specific cause of the sleeping sickness, and there Koch elaborated most important prophylactic and curative measures against this most melancholy disease.

This faithful servant of his race never rested. Coming from Africa, he took part in the International Congress at Washington, observing then: "I wish to devote myself for several years to come, to further investigations of these problems"—and this in his sixty-fifth year.

Thus Koch's sojourn among us means this: Formerly men folded their hands supinely in the presence of horrible infections; now we know that by means extraordinarily simple and practical (how amazingly simple, *after they have been evolved*, are the conclusions of genius), by the rational use of our faculties, and by realizing that we ourselves are coefficients in the working out of our own destinies, it is indeed within our power to be rid of those infections which have up to our time prematurely destroyed half our race.

THE COLLECTION OF BUTTERFLIES.

(*Continued from page 484.*)

in the cyanide bottle, where it will quickly die (9). However, care must be taken in all these operations not to bruise the wings of the butterfly or moth. There are serious objections to this mode because the cyanide is poisonous, and even the fumes, if inhaled, will prove dangerous. Although this method may yield good results to some collectors, I have always used a simpler and more effective way. A bottle with a medicine dropper as a cork is filled with benzine or gasoline (8). The insect is secured in the same manner as previously explained, and a generous dose of benzine is administered, which kills instantly. The benzine will spread over the whole specimen, but soon evaporates and leaves the insect none the worse for the bath. When the insect is dead, it is placed in a paper envelope made in the manner shown in 10.

Some of the large moths have greasy bodies, and will, therefore, have to be degreased. This may be done by placing the envelopes containing the insects in gasoline for twenty-four hours or more.

Spreading the Insects.—If on reaching home there is time to spread the insects caught during the day, they should be taken out of the papers and treated in the following way: For use in spreading, a perfectly flat board with an absolutely smooth surface, some insect pins, some pieces of plate glass of different sizes, and a few needles stuck into match sticks are needed. The insect is taken between the thumb and the index finger, and an insect pin is pushed through the thorax, as demonstrated in 11. With a broad-tipped tweezers, which may be purchased at any instrument maker's for a small sum, the wings are taken hold of where they join the body, and are gently bent open until they remain in a horizontal position. Then the insect is placed upon the board and the pin is pushed in. Now a pin is inserted behind the heavy vein, and the wing is gently drawn forward until its base is perpendicular to the body. The pin is pushed into the wood. This operation is repeated with the other wings, and strips of glass are placed on them to press them flat. The pin which was first thrust through the thorax is now gently extracted. While the pin is being withdrawn, the pieces of glass should be held with the thumb and the first finger of one hand. The insects are left on this board for a week or two, and may then be removed for mounting (14). If the insects have

(*Concluded on page 491.*)

ICE MACHINES Corliss Engines, Brewers and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton St., Milwaukee, Wis.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD CO., 24 Frankfort Street, New York

CONSULTING ENGINEER.
ERNEST L. RANSOME
Reinforced Concrete
910 Madison Avenue, Plainfield, N. J.

RUBBER. Expert Manufacturers Fine Jobbing Work
PARKER, STEARNS & CO., 288-290 Sheffield Av., B'klyn, N. Y.

SOUTHERN STAMPING & MFG. CO.
Manufacturers of special and patented articles.
R. S., Nashville, Tenn.

MODELS! CHICAGO MODEL WORKS 173 S. MADISON ST. CHICAGO, ILL. ESTABLISHED 1857

Experimental & Model Work
Cor. & advice free. Wm. Gardam & Son, 224 Fulton St, NY

Magical Apparatus.
Grand Book Catalogue. Over 700 engravings 25c. Parlor Tricks Catalogue, free.
MARTINKA & CO., Mfrs., 493 Sixth Ave., New York

THE SCHWERDTLE STAMP CO. STEEL STAMPS, LETTERS & FIGURES BRIDGEPORT CONN.

Learn Watchmaking
We teach it thoroughly in as many months as it formerly took years. Does away with tedious apprenticeship. Money earned while studying. Positions secured. Easy terms. Send for catalog.
ST. LOUIS WATCHMAKING SCHOOL, St. Louis, Mo.

DRYING MACHINES For Granular Material S. E. WORRELL Hannibal, Mo., U. S. A.

MASON'S NEW PAT. WHIP HOISTS
save expense and liability incident to Elevators. Adopted by principal storehouses in New York & Boston
Manfd. by VOLNEY W. MASON & CO., Inc. Providence, R. I., U. S. A.

VENTRILOQUISM
Learned by any Man or Boy at home. Small cost. Send 2-cent stamp for particulars and proof.
O. A. Smith, Room 1309, 823 Bigelow Street, Peoria, Ill.

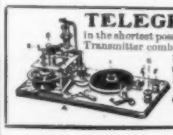
DO YOU USE GRINDSTONES?
If so we can supply you. All sizes **mounted** and **unmounted**, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. *Send for catalogue "L"*
The CLEVELAND STONE CO.
6th Floor, Hickox Bldg., Cleveland, O.

CROBET Swiss Files and other tools shown in "The Tool-Monger."
Sent free if you mention this paper when writing.
MONTGOMERY & CO., 109 Fulton Street, New York City

GERMAN ARCHITECT
Munich Polytechnicum, expert for steel concrete building, seeks situation in a large office. Apply to *Regierungs Baumeister Holzinger, Ansbach (Bavaria).*

TO AMERICAN MANUFACTURERS
Being established and representing West Indies firms, I am thoroughly equipped to handle and will accept the representation of American manufacturers of agricultural implements, typewriters, wind mills, sewing machines, etc., desiring to introduce their products in Spain. Best Spanish and American references. Address Manuel Lomba, Marques Cubas Street, No. 5, Madrid, Spain.

THE ARDREY VEHICLE WASHER
Pat. Aug. 15, 1905
Will wash CARRIAGE or AUTO perfectly.
Easy to attach to hose—Won't scratch varnish.
No splashing of water—Dry hands—Dry clothes
—Solid brass—only $2.00.
Booklet free. ARDREY VEHICLE WASHER CO. 181 E. Main Street, Rochester, N. Y.



TELEGRAPHY TAUGHT
in the shortest possible time. The Omnigraph Automatic Transmitter combined with standard key and sounder. Sends you telegraph messages at any speed just as an expert operator would. Five styles, $ up; circular free.
OMNIGRAPH MFG. CO.
39R Cortlandt St., New York

Free Catalogue of Scientific and Technical Books **Free**

We have just issued a new edition of our Catalogue of Scientific and Technical Books, which contains 144 pages, and a copy will be mailed free to any address on application.

MUNN & CO., Inc., Publishers of Scientific American
361 Broadway, New York

(*Concluded from page 490.*)

been left for any length of time in the triangular papers, they must first be relaxed or softened. This may be done by placing them over night between moist cloths in a box, adding a few drops of carbolic acid to prevent mildew. They should then be spread in the manner previously explained.

Mounting.—The last step in the preservation of the insects is the mounting. There are various ways in which this may be done, but the writer knows of none better than that invented by Denton Brothers of Wellesley, Mass. Cases of glass are made, varying in size with the size of the insect to be inclosed. These cases permit of a clear view of both the upper and under side of the specimen, as the top and bottom are made of glass. The insect is supported by its wings on a glass shelf (15). When the insect is placed in position, the top which is hinged at one edge is closed over it and is sealed with the passe-partout binding which forms the sides of the box. So simple is this method of mounting, that even a child can obtain very fine results. The mounts can be obtained at prices ranging from five cents up. There is another mount with which good results can be obtained—the Riker insect mount. These mounts consist of a neat cardboard box having a glass top cover and filled with fine cotton batting, in which the insect is readily embedded. The glass cover when closed holds the insect in place. The only objection to these mounts is that both sides of the insect are not visible, and therefore two specimens will have to be mounted to show both the upper and under sides. Riker mounts may be obtained from all instrument makers having a natural history department.

Collection of Specimens.—Now that the method of mounting and preserving the insects is known, the next thing to be done is the collecting of specimens. But terflies may be found in the open fields which are covered with wild flowers or in the sunny openings in the woods. Here the collector must stalk them. Never run after a butterfly. You probably will not catch it, and moreover may scare others resting near. As soon as the butterfly alights upon a flower, approach it carefully until within about five feet, then with a rapid sweep of the net capture it. The moths are harder to find because they fly at night. The method most often resorted to by collectors is known as sugaring. A mixture of brown sugar, stale beer, and molasses is made, and at dusk is painted upon the trees. In a few hours, if the locality is productive, the moths will be hovering about the trees in abundance, keeping the collector busy half the night.

Naming and Classifying.—When the insects are mounted they will have to be named and classified. Butterflies and moths belong to the order called *Lepidoptera*. Few people know the difference between butterflies and moths. There are several great differences. In the first place, all butterflies have club-shaped antennæ or feelers, that is, the feelers terminate in a club. All members of the order Lepidoptera which have not club-shaped antennæ are moths. In the second place, all butterflies are diurnal, that is, they fly by day, while most of the moths are nocturnal, or fly by night. Several minor differences may be noted, the first of which is, that butterflies generally hold their wings erect when at rest, whereas most of the moths fold them down. Secondly, butterflies transform from the caterpillar stage to the winged stage in a naked chrysalis, and moths have a covering, no matter how primitive, which is called a cocoon.

Reference Work.—In all entomological work standard books are necessary in order to identify the specimens. Dr. Holland's Butterfly book and his Moth are standard American works, and in them may be found colored plates comprising pictures of most of the butterflies and moths of North America, north of Mexico, with pictures of their caterpillars, chrysalids, and cocoons.

Rite-Lite Shaving and Dressing Glass

Raises and lowers 8 in. Slides 14 in. in front of window. Nickeled fixtures. Beveled plate mirror. Turns on swivel.

Price Delivered
6 in. Diam...$2.00
7 in. Diam... 2.50
7 in. (Double) 5.00
(1 side magnifying, 1 side flat)

Free Trial Will send subject to 10 days' trial. If satisfactory remit. If not return.

Rite-Lite Shaving Glass Co., Dept. 5, 248 N. Salina St., Syracuse, N. Y.

Use A FOX MOTOR In Your Boat

Fox Motors

Holds the WORLD'S Endurance Record
Made in 18 Sizes. 3½ to 80 H. P.
30 Days' FREE Trial. 8 Years' Guarantee
THE DEAN MFG. CO.
213 Front Street, So. Cincinnati, Newport, Ky.

SPARK COILS

Their Construction Simply Explained

Scientific American Supplement 160 describes the making of a 1½-inch spark coil and condenser.

Scientific American Supplement 1514 tells you how to make a coil for gas-engine ignition.

Scientific American Supplement 1522 explains fully the construction of a jump-spark coil and condenser for gas-engine ignition.

Scientific American Supplement 1124 describes the construction of a 6-inch spark coil.

Scientific American Supplement 1087 gives a full account of the making of an alternating current coil giving a 5-inch spark.

Scientific American Supplement 1527 describes a 4-inch spark coil and condenser.

Scientific American Supplement 1402 gives data for the construction of coils of a definite length of spark.

The above-mentioned set of seven papers will be supplied for 70 cents.

Any single copy will be mailed for 10 cts.

MUNN & CO., Inc., Publishers
361 Broadway New York

Salesmen Wanted

Traveling Salesmen earn from $1,000 to $10,000 a year and expenses. Over 700,000 employed in the United States and Canada. The demand for good Salesmen always exceeds the supply. We will teach you to be an expert Salesman by mail in eight weeks and our **FREE EMPLOYMENT BUREAU** will assist you to secure a good position. We received calls for Salesmen from over 5,000 firms last year and could not fill our orders. Hundreds of our graduates who formerly earned $25 to $75 a month have since earned from $100 to $300 a month and expenses. Hundreds of good positions open for the spring rush. If you want to secure one of them or increase your earnings, our **free book, "A Knight of the Grip"** will show you how. Write or call for it today. Address nearest office.

Dept. 465. **National Salesmen's Training Association**
Chicago New York Kansas City Minneapolis San Francisco Atlanta

Instructive Scientific Papers

ON TIMELY TOPICS

Price 10 Cents each by mail

ARTIFICIAL STONE. By L. P. Ford. A paper of immense practical value to the architect and builder. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

THE SHRINKAGE AND WARPING OF TIMBER. By Harold Busbridge. An excellent presentation of modern views; fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

CONSTRUCTION OF AN INDICATING OR RECORDING TIN PLATE ANEROID BAROMETER. By N. Monroe Hopkins. Fully illustrated. SCIENTIFIC AMERICAN SUPPLEMENT **1500.**

DIRECT-VISION SPECTROSCOPES. By T. H. Blakesley, M.A. An admirably written, instructive and copiously illustrated article. SCIENTIFIC AMERICAN SUPPLEMENT No. **1493.**

HOME MADE DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS **161** and **600** contain excellent articles with full drawings.

PLATING DYNAMOS. SCIENTIFIC AMERICAN SUPPLEMENTS **720** and **795** describe their construction so clearly that any amateur can make them.

DYNAMO AND MOTOR COMBINED. Fully described and illustrated in SCIENTIFIC AMERICAN SUPPLEMENTS **844** and **865.** The machines can be run either as dynamos or motors.

ELECTRICAL MOTORS. Their Construction at Home. SCIENTIFIC AMERICAN SUPPLEMENTS **739, 761, 767, 641.**

Price 10 Cents each, by mail

Order through your newsdealer or from
MUNN & COMPANY, Inc.
361 Broadway New York

DRAWING MATERIALS
E. G. RUEHLE & CO., Manufacturers
119 Fulton Street, New York, U. S. A.
We Do Repairing of all kinds of Instruments

Rider Agents Wanted

in each town to ride and exhibit sample 1910 bicycle. *Write for Special Offer.*
Finest Guaranteed **1910 Models** **$10 to $27**
with Coaster-Brakes and Puncture-Proof tires.
1908 & 1909 Models $7 to $12
all of best makes
100 Second-Hand Wheels *All makes and models,* **$3 to $8**
good as new.
Great FACTORY CLEARING SALE
We ***Ship on Approval*** *without a cent deposit, pay the freight* and allow
TEN DAY'S FREE TRIAL.
TIRES, coaster brake rear wheels, lamps, sundries, *half usual prices.* **Do not buy** till you get our catalogs and offer. *Write now.*
MEAD CYCLE CO., Dept. S, 175 Chicago

How Would You Like to Have
A SUMMER HOME
Built, Furnished and Equipped with Garage, Automobile and Motor Boat for
$2,000

Esther Singleton tells how the above may be purchased in her article which appears in the June number of

American Homes and Gardens

The article specifies the cost of the house, the garage and the boat house; the cost of the automobile and motor boat. It also gives the exact cost of each article of furniture and each piece is illustrated, so that the reader can judge for himself whether the objects described appeal to his particular taste.

Copies of this number of

American Homes and Gardens

can be purchased at news stands, and in the Subway and Railroad Stations.

Price, 25 Cents

MUNN & COMPANY, Inc., Publishers
361 Broadway, New York, N. Y.

BERTILLON AND THE BURGLAR'S JIMMY.

(*Concluded from page 484.*)

two dynamometers of unequal power. The stronger dynamometer, having a maximum capacity of one ton, and designed for the measurement of vertical efforts, is connected to the top of the frame by a screw, by means of which it can be raised or lowered a few inches. The lower spring of the dynamometer is attached to a heavy vertical steel plate, which slides in grooves along the two vertical posts. When the index of the dynamometer is at the zero point, the bottom of this plate, which is about 1½ inches thick, is about ¾ inch above the sliding horizontal plate. In this interval is inserted a wooden board ¾ inch thick, with its edge flush with the bottom of the vertical steel plate. The experiment is made by inserting between the board and the vertical steel plate the end of a "jimmy" or other burglar's tool, and endeavoring, by moving the handle of the tool up and down, to produce on the board impressions similar to those which have been found on doors and furniture. The index of the dynamometer moves in accordance with the effort exerted and, by means of a second index which remains fixed when the first returns to the zero mark, the instrument automatically registers the effort required to produce a given impression.

The figure thus obtained indicates only the vertical effort, or effort of pressure; but there is always a horizontal component of greater or less magnitude, and this is registered by a horizontal or traction dynamometer, which is attached to the sliding horizontal steel plate.

Either of the dynamometers can be used alone, or both can be employed simultaneously. In this way it is possible to measure the horizontal and the vertical efforts separately or in combination. In the latter case M. Bertillon has found that, as might be expected, the horizontal effort is always much smaller than the vertical or pressure effort. For example, using a lever 20 inches long, a vertical pressure of 1,300 pounds was obtained simultaneously with a horizontal traction of 330 pounds. A strong man, operating on a hard walnut plank, can develop a pressure effort of 1,500 pounds.

The apparatus can also be turned over on its side, so as to place the experimental board in a vertical position, for the purpose of investigating the forcing open of a door. In this case a second piece of wood is introduced to represent the jamb of the door. The same arrangement, in the normal position of the apparatus, is used for investigating the opening of a drawer, or a cylinder or other desk, etc.

The idea of employing a dynamometer in the study of burglary appears so simple, that it is surprising that it was not done long ago. Henceforth judicial inquiries will be guided by the results of a series of experiments which will furnish points of reference. From measurements made with the Bertillon dynamometer, it is possible to discover whether the burglarious entrance was effected by a man, a woman, a child, or several persons.

Finally, the study of the impressions made by tools has led M. Bertillon to give these impressions distinct names, according to the part of the tool by which they are produced. The word "foulée" is reserved for the impression made by the point of the tool, "écornure" for the notch made by the body of the tool in pressing on the edge of a door or piece of furniture; and the word "pesée" for the indentation produced by the elbow of a "jimmy" or similar tool on a plane surface. For the identification of the tool, the most valuable evidence is furnished by the "foulée."

DON'T BUY GASOLINE ENGINES UNTIL YOU INVESTIGATE "THE MASTER WORKMAN," a two-cylinder gasoline, kerosene or alcohol engine, superior to any one-cylinder engine; revolutionizing power. Its weight and bulk are half that of single cylinder engines, with greater durability. Costs Less to Buy—Less to Run. Quickly, easily started. Vibration practically overcome. Cheaply mounted on any wagon. It is a combination portable, stationary or traction engine. SEND FOR CATALOGUE. THE TEMPLE ENGINE MFG. CO., 496 West 15th St., Chicago. THIS IS OUR FIFTY SIXTH YEAR.

MONEY - BRAINS

We find capital to develop Inventions, Patents, Novelties, Manufacturing Industries, Partnerships, Water Rights, Mining Properties, or Mail Order Business of any legitimate character. If you want money in small or large sums, or if you want to invest money profitably, answer this advt. and ask us to send you (FREE) a live wire entitled "Money Against Brains" Agents wanted.

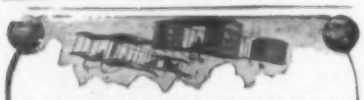
Wm. T. Lewis, President. MONEY - AGAINST - BRAINS BUREAU No. 618 Grinnell Building, Detroit, Mich.

CRUDE ASBESTOS

DIRECT FROM MINES

PREPARED ASBESTOS FIBRE for Manufacturers use

R. H. MARTIN, OFFICE, ST. PAUL BUILDING 220 B'way, New York.



A RELIABLE AERONAUTIC MOTOR

The Elbridge Featherweight

Combines light weight (178 lbs.) tremendous power (60 h. p.) extreme simplicity and perfect dependability.

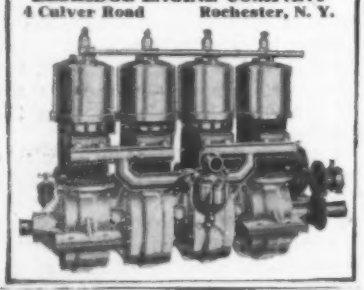
Used in speed boats and found absolutely dependable for many years before the word "Aeroplane" was used.

Adopted by professional and amateur aviators throughout the world.

Book of valuable information on modern types of two-cycle engines for six cents postage.

ELBRIDGE ENGINE COMPANY

4 Culver Road Rochester, N. Y.



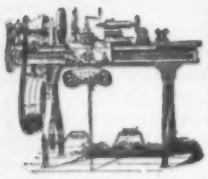
Running Water in Kitchen Bathroom Laundry Stable At Small Expense

If there's a running stream or spring on your ground, install a

NIAGARA HYDRAULIC RAM

and pump the water where you want it. Write for booklet A A and estimate.

NIAGARA HYDRAULIC ENGINE CO., 140 Nassau Street, N. Y. Factory, Chester, Pa.



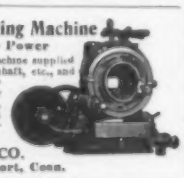
FOR GUNSMITHS, TOOL MAKERS, EXPERIMENTAL & REPAIR WORK, ETC.

From 9-in. to 13-in. swing. Arranged for Steam or Foot Power, Velocipede or Stand-up Treadle. *Send for Lathe Catalog.*

W. F. & JNO. BARNES CO. Established 1872. 1999 Ruby St., Rockford, Ill.

Pipe Cutting and Threading Machine

For Either Hand or Power



This machine is the regular hand machine supplied with a power base, pinion, countershaft, etc., and can be worked as an ordinary power machine or taken from its base for use as a hand machine. Pipe ⅛ in. to 12 in. diameter handled easily in small room. Illustrated catalog and price list free on application.

THE CURTIS & CURTIS CO. 6 Garden Street, Bridgeport, Conn.

"Responding to the Call"

from the practical mechanic for a Breast Drill that shall outlive all existing Tools of the kind, we are pleased to introduce the **"A. J. W. & CO." BREAST DRILL** with Gear Locking Device.

It has all the strong, useful and practical points of existing Drills, and **real** improvements added that are peculiar to itself. **Price, $5.50.**

A. J. WILKINSON & CO., MACHINERY 184-188 Washington Street, BOSTON, MASS.

Incorporate Your PATENTS and BUSINESS in ARIZONA

Laws the most liberal. Expense the least. Hold meetings, transact business anywhere. Blanks, By-Laws and forms for making stock full-paid for cash, property or services, free. President Stoddard, FORMER SECRETARY OF ARIZONA, resident agent for many thousand companies. Reference: Any bank in Arizona

STODDARD INCORPORATING COMPANY, Box 8000 PHOENIX, ARIZONA

DIE MODELS SPECIAL WORK TOOLS MACHINERY

NATIONAL STAMPING AND ELECTRIC WORKS 1005 Jefferson Street, Chicago, Ill.

HELMET OIL LUBRICATES ANYTHING SEND FOR SAMPLE FREE 19-21 S. CLINTON ST. CHICAGO U.S.A.

NOT Dangerous Like Open-Blade Razors. Not a Scraper Like Hoe-Shaped "Safeties." The

DURHAM-DUPLEX RAZOR

"The Safe Safety"

is a perfect shaving device that *every* man can shave with, combining the correct Sliding Diagonal Stroke with Safety-Guard and Interchangeable Blades.

Complete silver-plated set consisting of Razor, Stropping Attachment and 6 double-edged, hollow-ground blades of finest tempered steel; in kit as above or in handsome leather-covered case, $5.00. Other sets up to $8.00. Extra blades, six for 50 cents.

Illustrated Booklet free on request.

DURHAM DUPLEX RAZOR CO. 111 Fifth Avenue New York City

Free Trial Offer. We will send kit or box outfit upon receipt of $5. If not entirely satisfactory return within 30 days and we will refund your money.

Chicago Beach Hotel

American Plan | Finest Hotel on the Great Lakes | European Plan

An ideal resort uniting all city gaieties with the quiet of country and seashore. Delightfully situated on the shore of Lake Michigan close to the great South Park—10 minutes' ride from the theatre and shopping district. Every comfort—cool, refreshing breezes—smooth, sandy bathing beach—all summer attractions. Tourists and transients always find it a most attractive place to stop and rest. For Handsomely Illus. Booklet address Manager, 51st Blvd. and Lake Shore, Chicago

Demonstrator Agents Wanted in Every Community

Sent on 30 days' trial. (41)

16-ft. Steel Launch $96

Complete with Engine, Ready to Run

18-20-23-27 foot Launches at proportionate prices. All launches tested and fitted with Detroit two cycle reversible engines with speed controlling lever—simplest engine made—starts without cranking—has only 3 moving parts—anyone can run it. STEEL ROWBOATS $30.00. All boats fitted with air-tight compartments—cannot sink, leak or rust—need no boathouse. We are the largest manufacturers of pleasure boats in the world and sole owners of the patents for the manufacture of rolled steel, fork seamed, concealed riveted steel boats. Orders filled the day they are received. Write for Free Illustrated Catalog and testimonials of 10,000 satisfied users.

Michigan Steel Boat Co., 1332 Jefferson Ave., Detroit, Mich.

Iron all Day and Keep Cool

Plenty of heat on the face of the iron, but none in the room! If you own a "Fresco" you can iron all day in perfect comfort—at actually less expense than if you burned coal, wood or gas. The

FRESCO SELF-HEATING FLAT-IRON

makes its own heat from alcohol or gasolene. Use it indoors or out, on fine goods or coarse. Turn the flame up or down. Absolutely safe—every iron triple tested. *Booklet free.*

Agents—Every home needs the Fresco—good agents sell them successfully. Exclusive territory. *Write today.*

NEW YORK FLAT-IRON COMPANY Box 68 Belle Mead, N. J.

GREAT DOUGLAS Farm Engine

Most power, highest efficiency, at least cost. Simple, reliable, economical. Strong, steady, compact; perfectly governed; easily run. Improved two cycle design—no valves, cams, gears, springs, etc. Only three wearing parts. Works equally well with Kerosene, Gasoline or Distillate.

Runs any machine that can be operated with a belt. 2 H.P. $83.75; 6 H.P. $123.75 Shipped ready to run; other sizes in proportion. 30 Days Free Trial. Write for Catalog and details.

NEW BELLE ISLE MOTOR CO. 7 Motor Boat Lane, Detroit.

1 to 3 Miles per Hour Increased Speed Guaranteed

The Frontier Propeller is guaranteed to increase the speed of any boat or launch **from 1 to 3 miles per hour.** If it fails to do so, we will **refund your money.** Motorboatists who have tried all kinds of propellers, in search of increased speed, are enthusiastic about the wonderful results of the Frontier. Mr. W. S. Bryant, the designer, is the same expert who has been designing propellers, etc., for many years, and whose designs are famous. The Frontier is true pitch ¾ the length of blade. It is **diferential** at hub, **thus overcoming all agitation** at that point. Gives a shearing cut from hub to periphery, allowing wheel to work full length of blade. Discharges water in tapered volume aft, thus affording all efficiency, less a small percentage of slip. Such results cannot be had from any other Propeller. Made of metal "as strong as steel." Fill in the coupon and mail it today. We will send you our chart of questions, to be filled in by you, so that we can determine the size and pitch of wheel best suited to your boat. **Your money refunded if the Frontier fails** to increase your boat's speed.

FRONTIER DETROIT

FRONTIER PROPELLER CO. 826-846 Fort Street, Detroit, Mich.

...FILL IN AND MAIL...

The Frontier Engineering Co., 826-846 Fort Street, W., Detroit, Mich.

Send me your chart of questions, so that I can get more speed from my boat.

Name.....

Address.....

THE LITTLE CAMERA of BIG POSSIBILITIES

The No. 0 Graphic

THIS little camera is **fixed focus**—everything within its range is absolutely sharp.

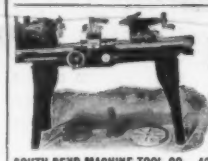
It is fitted with a high grade, high speed Anastigmat Lens, working at f-6.3 and a Graflex Focal Plane Shutter actuated to give any speed from "time" to 1/500th of a second.

The negatives made with the No. 0 Graphic show such wonderful definition that they may be enlarged to many times the original size and still retain all the brilliancy of the contact print.

This is the exact size of picture made with No. 0 Graphic

Send for Booklet

FOLMER & SCHWING DIVISION Eastman Kodak Company ROCHESTER, N. Y.



Free Interesting **Lathe Book** DESCRIBING SOUTH BEND LATHES 8 to 14-in. swing **$25.00 and up**

SOUTH BEND MACHINE TOOL CO., 421 Madison St., South Bend, Ind.

ONE DROP OF 3-IN-ONE

will go farther and do more than a whole bottle of inferior oil. **3 in One** oils, cleans and polishes, prevents rust. The first and only lubricating oil for sewing machines, clocks, watches, typewriters, bicycles, talking machines, roller skates, fishing rods. Best preparation for cleaning and polishing furniture. Only gun oil recommended by all leading firearm makers. Can't gum or soil or dry out quickly—contains no acid. 10 cts., 25 cts. and 50 cts. sizes. Library Slip with every bottle.

MAGAZINES & BOOKS FOR LIBRARY-SLIPS ONE IN EVERY PACKAGE

FREE generous sample and Dictionary—both free. Write for them.

3 in One Oil Co. 14 BROADWAY NEW YORK

PRINT Your Own Cards, circulars, book, newspaper. Press $5. Larger $18. Rotary $60. Save Money. Print for others, big profit. All easy, rules sent. Write factory for press catalog, TYPE, paper, &c. THE PRESS CO., Meriden, Conn.

MAKE YOUR BICYCLE INTO A MOTORCYCLE

At small cost by attaching the ERIE Attachment which includes all parts so that any one can make a strong machine that will climb steep hills and run for ½c. a mile. Sample at cost. Send 2c. stamp for Catalog S and special price.

MOTORCYCLE EQUIPMENT COMPANY, Hammondsport, N. Y.